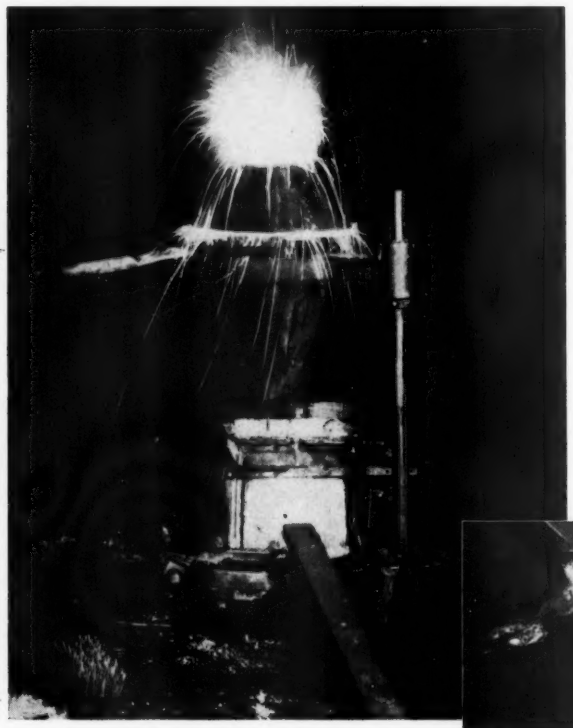
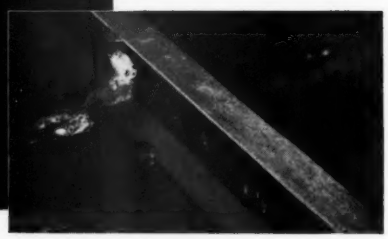
MINING CONGRESS JOURNAL

FEBRUARY 1941





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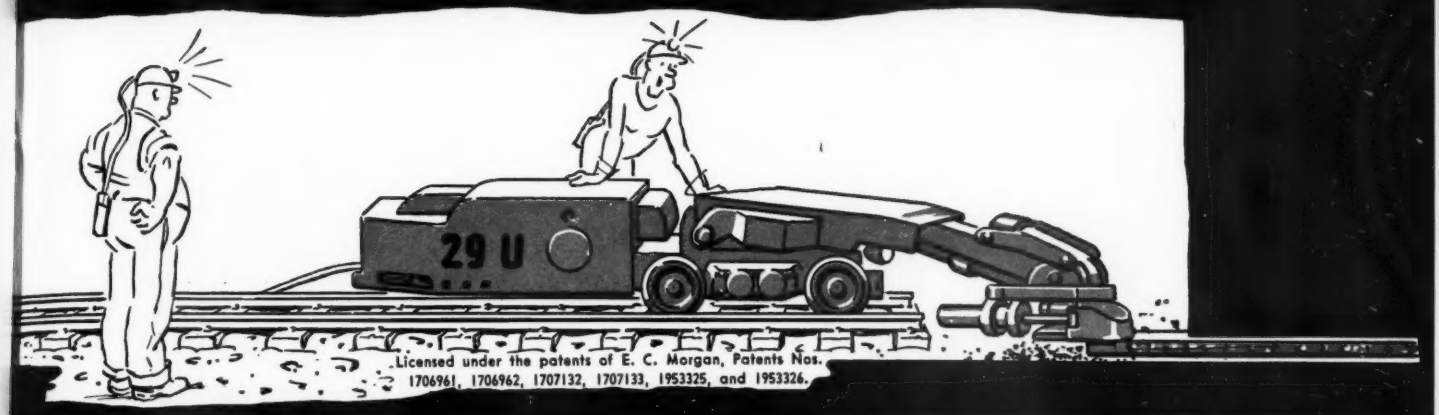

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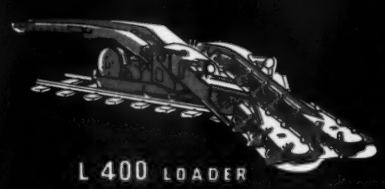

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MINING CONGRESS JOURNAL

Vol. 27 FEBRUARY, 1941 No. 2

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Published monthly. Yearly subscription, United States and Canada, $2.00. Foreign, $4.00. Single copies, $0.20. Entered as Second-Class Mail Matter, January 30, 1915, at the Post Office at Washington, D. C.

Member, Audit Bureau of Circulations

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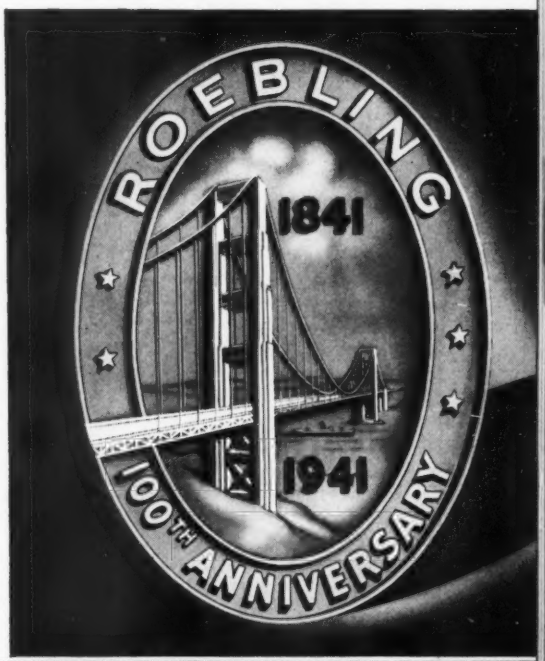

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1841 *BRIDGING A CENTURY WITH WIRE* 1941

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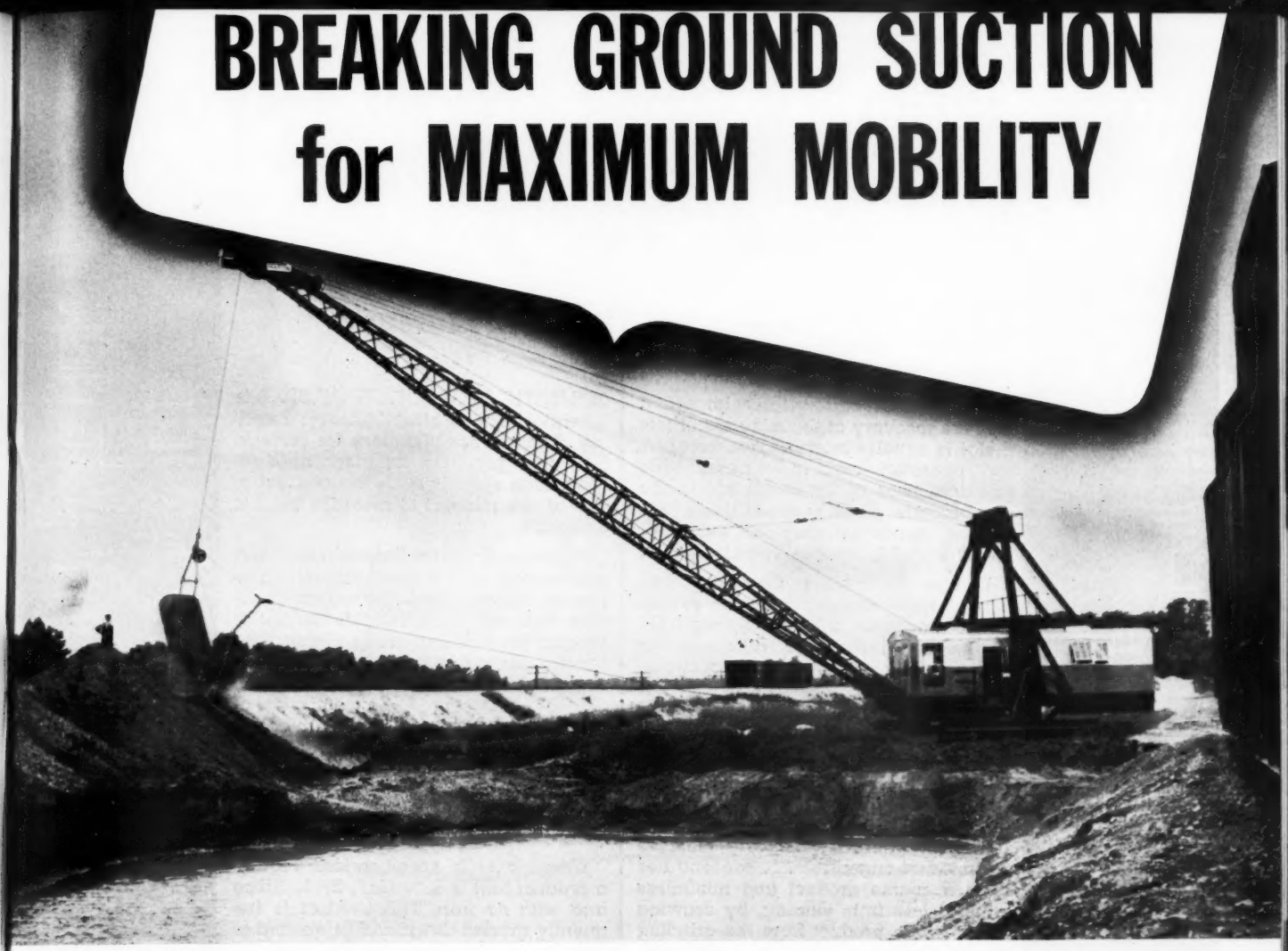

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MARION WALKER

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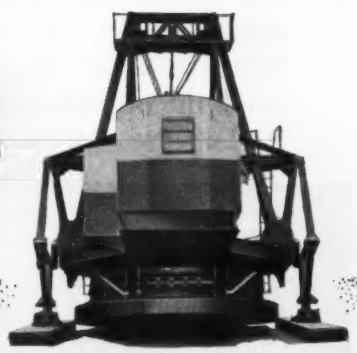

The rear view of a Marion Walking Dragline showing how the base is raised before the major step.

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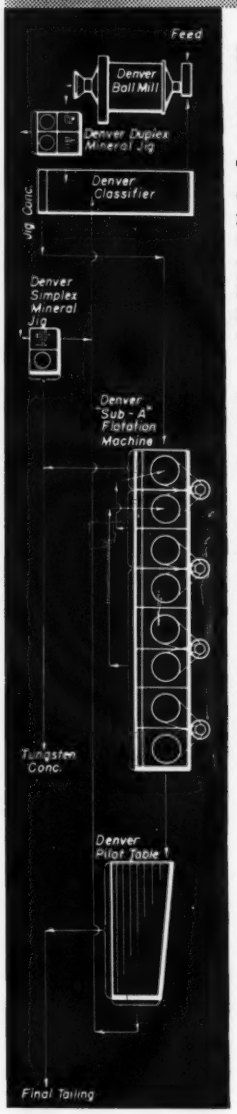

Scheelite $CaWO_4$
Wolframite (Fe, Mn) WO_4
Ferberite Fe (Mn) WO_4
Huebnerite $MnWO_4$
} **Tungsten**

TUNGSTEN is strategically important and the recovery of the minerals of this metal is equally interesting to prospector, operator, and industrialist. The principal uses of the metal are in the manufacture of high-speed tools, cemented tungsten carbides, stellites, tube filaments, various chemicals, etc.

Denver Equipment Company has gained wide experience in the extraction of tungsten minerals through the design and installation of plants for their concentration in several localities.

Tungsten minerals must be recovered as soon as they are freed from the gangue material on account of their inherent sliming characteristics . . . the Denver Mineral Jig is the most acceptable unit for this job . . . it is placed in the grinding circuit as shown in the flowsheet where it positively removes the mineral when free . . . concentrates it as a coarse product and minimizes mineral loss from sliming. By drawing a low grade product from the grinding circuit, maximum recovery is obtained. This material may be cleaned to market grade in the cleaner jig as shown with tailing returning to the classifier.

For positive recovery of fine tungsten values, Denver "Sub-A" Flotation Cells have no equal. They most efficiently recover remaining values at minimum capital and operating cost. The separation of scheelite and wolframite frequently is a problem but is easily accomplished in Denver cells due to the high degree of selectivity obtainable.

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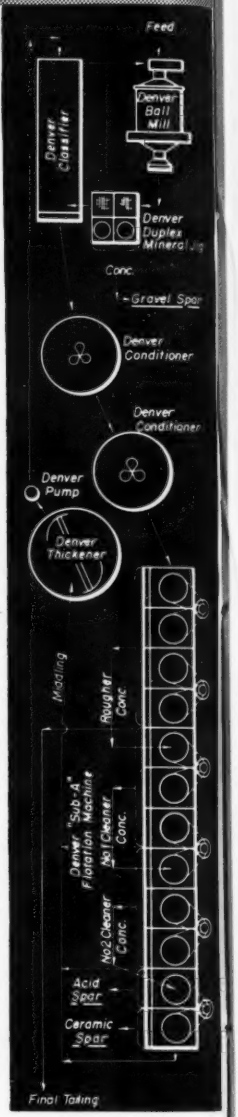
Ceramic spar specifications require a product that is 96% CaF_2-2½% Silica and with no iron. This product is frequently graded down and briquetted to supply gravel spar to the steel industry.

The several cleaning steps required to satisfy these rigid market requirements demand accurate flotation control and a high degree of selectivity and flexibility within the flotation machine. Denver "Sub-A" flotation cells are universally used in the fluorspar industry due to their ability to perform several cleaning steps within the machine by gravity and without the use of pumps or elevators.



The above metallurgical plants are typical commercial installations engineered by Denver Equipment Company, who has also had wide experience on other types of non-metallic plants such as talc, phosphate, graphite, coal, kyanite, salt-mixture, silica sands, tar sands, feldspar, limestone, magnesite, zircon, chromite, bauxite, etc. Our engineers will welcome the opportunity of working with you on your treatment problem. Write today for Bulletin No. T4-B3. Use our batch and continuous ore testing facilities.

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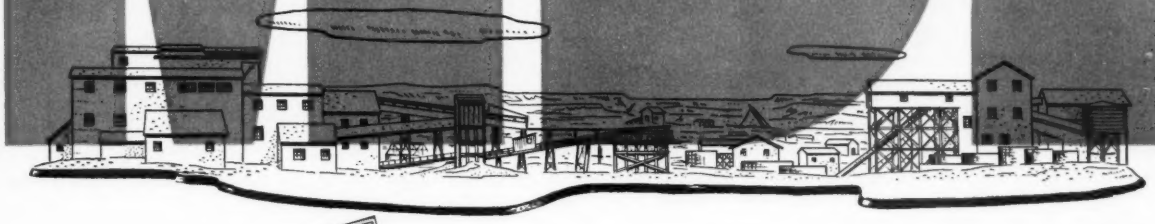

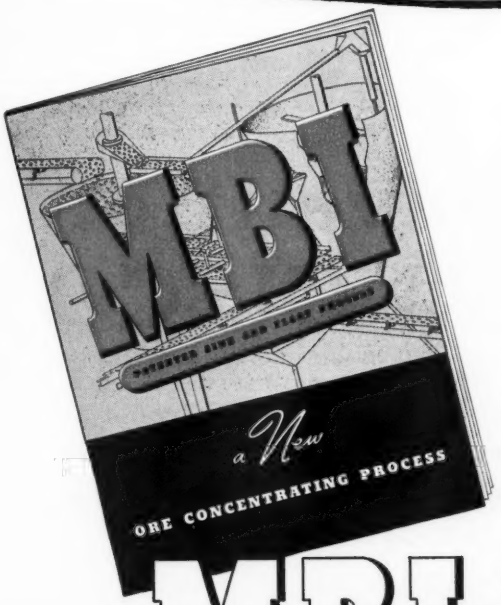

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A JOURNAL FOR THE ENTIRE MINING INDUSTRY—PUBLISHED BY THE AMERICAN MINING CONGRESS

MINING CONGRESS JOURNAL

RUSSELL C. FLEMING
Editor

Vol. 27 FEBRUARY, 1941 No. 2

WHY ANOTHER BILL?

IT IS easy to understand why many people, including legislators, will rally to the support of a bill which purportedly would stop coal mine explosions. In a marked measure, this is simply a repetition of the old cry, "there ought to be a law." It now becomes the plain duty of those who have been intimately acquainted for years with coal mines and coal mine catastrophes in this country to place the facts before the public. There has recently been a flood of publicity in certain newspapers and magazines which has, let us hope, been published innocently, but which unfortunately most cruelly asserts that passage of a Federal Coal Mine Inspection bill by the National Congress will put an end to coal mine explosions. These statements are patently untrue.

The facts are that the organic act authorizing the creation of the United States Bureau of Mines was passed by the National Congress over thirty years ago, and at that very time it was decided by mine managements, experienced workmen's representatives and the members of the National Congress, that the authorization of compulsory federal inspection would do more harm than good. Until recently, the wisdom of these men has never been questioned. The helpful work of the Bureau of Mines expanded and became increasingly effective, and the number of mine explosions became steadily less and less. But since 1930, we of the mining industry have all been guilty of a costly error of omission. We have failed sufficiently to arouse public opinion in order to secure for the Health and Safety Branch of the Bureau of Mines the proper allocation of appropriations with which to carry on and expand their anti-catastrophe educational and inspection work. By 1930 the custom of mine management to call upon the Bureau of Mines to furnish trained men for safety inspection was well established throughout the entire country. It was a protective service, deeply appreciated by the managers of coal mining properties and effectively followed by the excellent men of the Bureau. The heavy cuts in Health and Safety Branch expenditures, largely due to intra-departmental allocation, seriously restricted this valuable inspection service, and it is only now at about 60 percent of its 1930 status. Coal mine managers and state mining department inspectors greatly desire that this service shall be restored and expanded; and the rapidity with which underground coal mining methods and equipment are advancing makes it imperative that the Secretary of the Interior, through the channels which are available, immediately secure and allot the proper funds.

There were six major coal mine explosions in the United States in 1940. In the future explosions can be stopped, and they must be stopped. The situation calls for leadership and the Secretary of Interior is capable of that leadership. The mining industry will be grateful for his help.

TRIBUTE TO A GREAT AMERICAN

AMERICANS take pride in the United States as the greatest industrial nation of the world. We are wonderfully endowed with mineral resources, and our phenomenal development and employment of these resources has made us the envy of less-favored nations. Engineers and technologists whose ability, foresight and energy have made the development possible have been and are justly honored by the technical societies with medals and awards.

This month we pay reverence to a man who contributed enormously to the growth of the mining industry, not directly but in that the fruit of his genius has created a market of incalculable extent for mineral products. That man is Thomas Edison, born at Milan, Ohio, February 11, 1847. No one can know what the mineral industries—indeed, what all industry—would be now if Edison had not lived. But we can evaluate the magnitude of his contribution by adding the totals of the tremendous amounts of materials employed in industries benefiting from his inquisitive and busy mind. The essence of his genius may be simply stated, as the ability to devise new uses for materials, principally metals, in ways that add directly to the comfort, well-being and efficiency of mankind.

Edison's inventions resulted in whole new industries. Among the products bringing this about are the electric light, the first commercial system of electric power distribution, motion picture projectors, the phonograph, the quadruplex and multiplex telegraph systems, office dictating machines, nickel-iron storage batteries, the Universal stock ticker, the thermionic tube (ancestor of modern radio tubes), the carbon microphone transmitter which made telephony a commercial art, as well as many others. He also contributed the first electric railway, the magnetic ore separator, the electric cap lamp for miners and other developments now indispensable to mining.

February is the month of Washington and of Lincoln. It is equally the month of Edison, the benefactor of humanity in ways material and not political.

Annual Review

MINING in 1940

The BITUMINOUS COAL INDUSTRY in 1940

● ***Industry had 454,000,000 ton year, best in a decade. Fourth quarter down with advent of minimum prices. Outlook better for 1941.***

FROM the standpoint of production and probably from the standpoint of earnings, 1940 was the best year the bituminous coal industry has seen in the past decade. Preliminary figures indicate that the output for the year was about 454,000,000 tons compared with 393,065,000 tons produced during the year 1939, an increase of 60,935,000 tons or 15.5 percent. Production during the first three quarters of the year exceeded that of the corresponding period of 1939 by 68,696,000 tons or 25.9 percent. This increase reflects in part the six-week shut-down in April and May, 1939. In the fourth quarter of 1940, however, less coal was produced than in the corresponding quarter of 1939—about 120,000,000 tons as against 127,761,000 tons in the same period of the previous year, a decrease of 6.1 percent.

Minimum Prices Go Into Effect

Most companies experienced better financial results in the first three quarters of 1940 than in the corresponding 1939 period. The results in the last quarter of 1940 were affected by the stocking of coal in advance of the effective date (October 1, 1940) of the Coal Act prices and by the effect of the prices themselves. It is too early yet to tell whether because of lower production, higher costs, and greater sales expense, financial results were as good under the first three months of the Bituminous Coal Act prices (October-December, 1940) as they were during similar months of the previous year. This cannot be definitely known until the Coal Division of the Department of the Interior furnishes statistics for the two periods, which it is hoped will be done at an early date.

Other than the advent of minimum prices there were no extraordinary or unusual developments in the industry during the year 1940. A very pleasing occurrence from the standpoint of both operators and miners was the increase in total production mentioned above. This is the most healthy condition that the industry has experienced for a good many years and it is probable that this trend in production will continue during 1941. This increased production was brought about mainly by better industrial demand—partly because of national defense activities—together with the increased demand during the early part of 1940 occasioned by unusually cold weather.

The industry has gone forward in an orderly way expanding its efforts to mechanize its mines and reduce costs to enable it to meet competition. It has made extensive expenditures for plant and equipment for the purpose of better cleaning, preparing, and sizing its coal to fit the needs of the consuming public. It has given more than usual attention to the treating of coals with the idea of eliminating dust as far as possible and with the idea of improving both the attractiveness and value of coals for domestic and industrial fuel requirements. The Coal Show of the American Mining Congress held in Cincinnati in May, 1940, was a revelation of the progress being made. Likewise the industry has expended more time, effort, and money than usual in research to find more uses for coal, as well as aiding its customers in better combustion and utilization.

Export business in 1940 exceeded that of 1939 by 5,295,521 tons or 45.7 percent. This is not a large amount but it was very helpful to the districts shipping the tonnage.

The public in general and bituminous coal consumers in particular manifested more interest in coal than has been evidenced in many years. As business demands have increased coal consumers, remembering periods of stress during the World War and the years immediately following, have wisely sought larger stocks and taken added precautions to protect their supply. This may have been accentuated to some degree by the fear of labor troubles in 1941 similar to those of 1939, and is partially due to the fact that buyers always buy more liberally when prices are advancing regardless of the commodity or merchandise being purchased.

There have been substantial improvements in mining machinery equipment. Producers are eager to take advantage of these improvements and nearly all the manufacturers of coal mining and preparation equipment have operated their plants practically at capacity throughout the year.

Employment and Earnings Up

Mine labor has had more employment and larger earnings in 1940 than for many years. The number of men employed now probably exceeds that of any period for the past 10 years.

It does not follow that the coal industry as a whole was prosperous in 1940. Coal was sold only under 30-day spot sales provisions throughout the year. The Bituminous Coal Division regulations prohibited, prior to November 15, contracts or sales for longer periods. In spite of the increased demand the desire on the part of the operators for volume held prices to a low level. Companies having regional sales agency connections were in a better position to take advantage of and profit by the improved situation brought about by the increased demand for coal.

The coal industry went through a very complicated period in 1940 in preparation for minimum prices the date for which was many times postponed. The advent of effective prices on October 1 concluded 40 months of effort, delay and uncertainty. It is too early to make an accurate statement as to the probable result under this law. Temporarily it is reported to have retarded production and increased cost, this being partially offset by some increase in price on certain grades of coal.

Minimum Price Provisions Had Short Time for Trial

This experiment will extend until at least April 26, 1941. Then the Act may be extended by Congress for another trial period. The industry has had little time to appraise the value of this law in actual operation. The Act does, theoretically at least, establish a minimum below which coal cannot be sold at the mines, but the rules concerning sales agents, distributors, and wholesalers are such that it is difficult to tell at this time whether the operator is in the end receiving more or less money under these minimum prices than he received heretofore. In certain cases consumers who, under the law of supply and demand were paying a fair price for their industrial coal, have been able to bring their buying price down to the minimum set under the Guffey Act, a minimum intended to return average cost to a large area. This was something that was not expected but is not an unnatural outgrowth of the method of administering the law. The coal industry and purchasing agents have talked so much about government prices that both overlooked the fact that these prices were not intended to be sales prices but merely minimums below which coals should not be sold—minimums established without allowance for interest or profit. Nevertheless, a large part of the industry and a great part of the buying public have looked upon these prices just as they look upon railroad or utility rates, which were set not at cost but at cost plus a fair return on invested capital. Whether or not the industry can overcome this psychological situation is difficult to tell.

Selling Costs Increasing

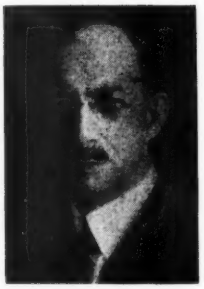
Under the Coal Act there appears to be a rapid increase in the cost of selling coal due to rules and regulations covering the distribution by sales agents, wholesalers, and distributors. Prior to the effective date of minimum prices and marketing rules and regulations the average cost of selling coal was about 12 cents a ton. Wholesalers and distributors, properly registered with the government division, can now quote to a given customer the same price as the producer. Thus many buyers heretofore purchasing direct from the coal operator are now insisting on receiving their coal through a middleman. Of course, the operator is not compelled to sell in that fashion; but to refuse is to lose the business. This added transaction can add as much as 20 cents a ton to the cost of sales. A combination of the commissions and discounts which may be allowed under the Government minimum prices can readily amount to 50 cents a ton. If this situation continues it has been estimated that it may cost 50 percent more to sell coal in 1941 than in 1940 and this trend may continue in the years to follow. This cost will ultimately have to be added to the selling price of the product if the industry is to receive cost alone for its coal.

Complications and delays in establishing and coordinating minimum prices have been great. The work of the executive, sales, and accounting departments of the industry has been increased many fold under the Act. In the opinion of many, the effect of a law of this kind cannot be well judged in a period of increased production and increased demand and sales.

Three-Year Program of Combustion Research Started

One of the bright spots in the industry is the fact that the National Coal Association has put into effect a three-year research program looking toward the manufacture of better burning equipment for both domestic and industrial use. Another outstanding accomplishment was the agreement of the Directors of that association on an advertising program for a three-year period, the purpose of which would be to resell the public on the value and importance of coal as an industry and as a fuel. If this program can be put into effect in the early part of 1941 and carried out as planned, the benefits to the industry over the next few years will be great. This is one of the most forward looking steps taken by the industry in the past quarter of a century.

Operating Progress in BITUMINOUS COAL MINING



By L. E. YOUNG
Mining Engineer
Pittsburgh, Pa.

BITUMINOUS coal mining made substantial technical progress in 1940, particularly in the mechanization of underground mines. In another review, statistics of equipment sold and of estimated production in 1940 are given, which show how definite is the trend toward complete mechanization in certain fields and districts.

Any thoughtful analysis of the progress and trends in the mechanization of underground mining of flat bituminous coal beds must consider, (1) the various physical seam conditions; (2) the system of mining and the recovery attempted; and (3) the preparation and marketing factors. It has long been recognized and it still is true that no one type of mechanical loading device can be pre-eminently the sole answer to all problems. The old mine, with limited life and with substantial investment in tipple and transportation equipment—the mine having all its available coal in pillars—the mine with low coal and hard sandstone roof—the mine with tender slate roof and no cleaning plant—each presents its own problem and no uniformity in solution of problems or of trends can be possible with such diverse conditions.

The number of new mines opened in the last 10 years has been small, and the progress in mechanization has in large measure been made under the handicap of placing new types of equipment and new methods in old mines, or in mines continuing operations in part on an old system. The hand-books, reviews, and annuals give splendid examples illustrating the diversity of successful installations.

In reviewing the work of 1940 the following subjects are worthy of note:

1. Concentrated mining with multiple shifting of rooms and of pillar work has required more rapid driving of mains and of panel or butt entries; more emphasis is being paid to systematic and scheduled advance of development work.

2. In thin beds where it has been necessary, due to the height of cars, live stock, etc., to handle roof or floor material, the use of conveyors or shuttle cars is increasing rapidly, both in room work and butt-entry development.

3. Concentrated mining and rapid advance of panel entries and of rooms has directed attention to the cost of track laying, the delays incident to track laying, and the conflict in the moving of track equipment in panels which are being multiple-shifted. As a result there has been a very marked increase in trackless mining in a number of districts.

4. There has been greater recognition of the fact that cutting machines and loading machines have frequently been operating with a poor "load factor." Various changes have been made to correct this, such as (a) shorter and quicker moves of equipment; (b) more tonnage per place; (c) larger mine cars or the installation of "shuttle" or "transfer" cars; (d) sectionalized switches and turnouts (where track is preferred to trackless mining); (e) quicker removal of powder smoke, or the use of a system of breaking down the coal without the production of smoke; and (f) maintenance of equipment or use of spares so as to assure no delays during the production cycle.

5. In several large mines, where pillars are mined, there has been a tendency to reduce the number of working places assigned to a loading-machine crew and to time each step in the preparation cycle so that a place on a breakline is not cut and shot until immediately before it is required. This means that no places are cut and shot unless they can be loaded out within a few hours.

6. Considerable progress is being made in certain mines in the organization of small crews which shall spend the entire shift in one or two working places. Where conveyors are used and practically continuous operation is possible, the cutting, drilling, shooting, loading, timbering, and the extending of conveyors is done by the same men. The delays incident to moving the men and equipment from place to place have been found to be more expensive than those occurring when men have to stop work to permit shooting, provided there is no serious delay on account of powder smoke.

7. Where a large tonnage per cut is possible, the trend is toward more powerful loading machines, and bringing the preparation work into step with the working cycle of loading and transportation.*

* Coordination of Face Preparation with Mechanical Loading. J. W. Anstead, Coal Mine Modernization Year Book, 1940, p. 18.

Cutting Machines

There has been increasing use of powerful track machines, some of which both cut and shear. In order to prepare coal for mines using trackless loading and face transportation, it has been necessary either to provide trucks (on caterpillars or tires) to move shortwall machines from place to place, or to mount the standard track cutting machines on caterpillars or rubber tires. One of the most interesting developments of the year has been the last mentioned procedure of mounting and operating the heaviest type of cutting machine on rubber tires. The use of dual wheels has been necessary in one instance in order to keep the machine as low as possible. The year 1941 will probably witness radical innovations in the use of rubber tires in trackless mining.

There is little new to report on cutting-machine chains, bits, and sharpening, but the best practice is being extended to more and more mines.†

American operators are still waiting for American manufacturers to develop practical devices for handling the cuttings mechanically from shortwall cutting machines.

Drilling

More recognition is being paid to this operation. Largely due to the desire to drill large holes for CO_2 shells, compressed air shells, and hydraulic tubes, there is continuing improvement in drills, drill bits, augers, and mountings. There have been more applications of special tool steel in drilling coal and rock.

Shooting

The lifting of the ban against shooting on shift with permissible explosives or devices in certain states has stimulated interest in face preparation, speedy removal of smoke from the working places, and scheduled shot-firing. There has been a substantial increase in the use of permissible devices for breaking down coal. For example, in one district, 15 mines were using CO_2 cartridges in 1939, and 48 mines were using it in 1940. The tonnage increase of coal thus mined in the given district was 175 percent.

It is interesting to note that in western Pennsylvania 30 mines are using CO_2 cartridges underground as a fire-fighting safety device.

During the year the hydraulic mining process was placed on the market. Detailed descriptions of the equipment and of the process have appeared in earlier issues of the JOURNAL.* The industry will watch the first installations with great interest in order to learn how this system will compare with older practices as to (1) operating cost; (2) adaptation to current methods of using mobile loaders and conveyors; and (3) percentages of sizes and firmness of lumps.

Ventilation

Shooting on shift and multiple-shifting has stimulated the use of blowers, tubing, etc., for improving face ventilation in directing more air to the working faces being advanced rapidly into gassy coal, as well as for removing powder smoke.

The rubber-tired shuttle car has been used effectively in conjunction with the mobile loader in cleaning air courses in which no track is installed. The periodic cleaning of air-courses with this type of equipment has resulted in substantial improvements in ventilation without the expenditure of large sums for relaying track in such air-courses.

Conveyors

There has been continued interest in all types of conveyors. The shaking conveyor, with and without duckbill, has made splendid records in thin coal and where timbering has been necessary under heavy slate, as well as under more favorable conditions. Manufacturers are promising improvements in the duckbill to adapt it to continuous loading across a face and in mining pillars. One manufacturer has announced a shaking conveyor having a capacity of approximately 200 tons per hour of run-of-mine coal; it is claimed with this improved conveyor the coal will travel 75 ft. per minute.

At a western mine where shaking conveyors are used, a swivel has been designed to permit the operation of either one of two trough-lines and duckbills from one drive.

There has been increased use of chain and flight conveyors to take coal from mobile loading machines,* and there have been a large number of installations of so-called "Mother" belts to take coal from room units on which the coal has been loaded either manually or mechanically.

It is announced that there will be installed shortly, several 30-in. trough belts, upon which rubber-tired shuttle cars will discharge directly.

During the year there has been considerable improvement in handling trips of empty and loaded cars under elevators, loading heads, and loading stations. Car hauls with barneys, and special devices for eliminating hazards and reducing labor at the loading stations have been developed.

Mobile Loaders

During the year practically all of the manufacturers building mobile loaders have made improvements on existing models or have brought out

† Adaptation of Cutting Bits to Mining Conditions. John W. Bach, Mining Congress Journal, January, 1940, p. 23.

* Breaking Down Coal at the Face with New Hydraulic Mining Process. Mining Congress Journal, April, 1940, p. 39.

* Mechanical Loading onto Conveyors. G. S. Jenkins, Coal Mine Modernization Year Book, 1940, p. 71.

Mobile loaders are speeding up operations

new models. In the class of track machines,* the improvements have been largely in increasing the angle of operation of the front head and of the rear conveyor—one new machine can swing the front head 55° right and left, and the rear conveyor 40° right and left. This will prove valuable, especially in the loading of pillar coal. During 1941 we may see two mobile loaders on rubber tires. A new low height machine, suitable for loading into conveyors, has passed through the first period of underground trial and is now well along in the second stage. The unit is 26 in. high, and it is proposed that in coal 30 to 36 in. high it will load a maximum of 3½ tons per minute.

The caterpillar type of loading machine has continued to make progress in thick and thin coal and in pillar work, as well as development and room work.

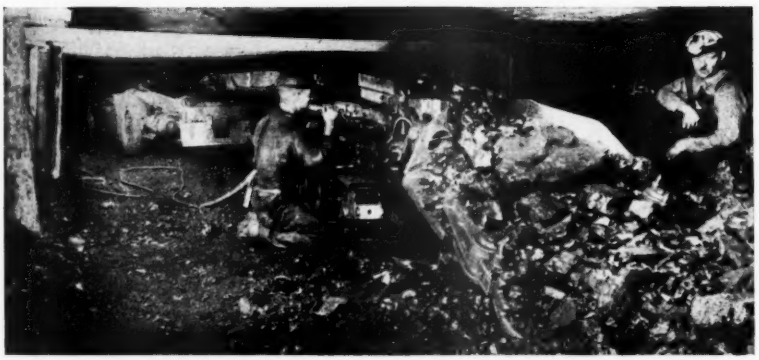
There have been a number of improvements (or protective devices) on mobile loaders to reduce hazards to the operating crew† and to increase the facility in handling and moving of the machine.

Shuttle and Transfer Cars

Several experimental installations of large transfer cars operating on track have been made in the Appalachian field, largely on account of the pioneering work done in the Indiana-Illinois field and, in general, following the layout and practice developed there.

During the year there have been many installations of rubber-tired shuttle cars, the total number now in service being nearly 400. It is interesting to note that this type of equipment is being used in many different beds in various parts of the country.†† A recent survey shows that shuttle cars are being used in 22 different coal seams, ranging in height from approximately 3 ft. to 12 ft.

While the larger number of these cars are driven by storage batteries, there have been a number of installations of cable reel units, and one installation in which both cable reel and double-trolley are installed on the same cars.



Many operators are increasing machine capacity through the use of rubber tired haulage

Shuttle cars are being used at the present time to load directly into mine cars or onto transfer elevators, but, as previously noted, there are several installations to be made shortly in which the shuttle cars will discharge directly onto a 30-in. trough conveyor.

In order to facilitate the turning of the car into rooms and pillar work where little space is available, cars are being equipped with four-wheel steering.

An important application of the self-unloading shuttle car has been in the handling of waste material underground. When worked-out rooms are available, waste material can be taken by the shuttle car to the area to be filled and the material may be discharged onto the floor. If necessary, the waste material can be stacked with a mobile loading machine.

While these cars have been designed to haul coal, they are being used to transport timber and other supplies, and in several instances are being given the severe task of post-pulling.

Scrapers

An interesting development for low coal is the small scraper adapted to mining 22- to 24-in. coal where hand or mechanical loading is employed. This unit consists of a box with self-dumping bottom and is drawn by a three-drum hauler type hoist to a ramp or slide where the box unloads into standard mine cars.

Mining Practice

The possibilities for improvement of equipment and practice ordinarily must be planned to accomplish one or more of the following objectives:

1. Operate the equipment at faster speeds.

2. Carry larger unit loads at present speeds.

3. Eliminate some of the incidental operations or combine operations.

4. Reduce the amount of manual labor incident to the several operations, or eliminate certain types of manual labor entirely.

5. Secure continuity of operations by careful scheduling* or by coincident performance of what are now separate jobs.†

There has been continued interest in modified longwall, systematic recovery of pillars, and special systems of roof support to permit the use of mobile loaders, duckbills,†† and conveyors.††† There is increasing use of mobile loaders in open-end pillar work‡ and marked improvement has been made in track work for mechanical loadings.§

Underground Power

More thought is being given to the maintenance of proper voltage and adequate power at the working faces. It is recognized that each mine has its own power problems which change as the workings advance or retreat. The Power Committee of the Coal Division has made timely contributions in the matter of Underground Substations.‡‡

* Track-Mounted Loading Machines. R. L. Adams, Coal Mine Modernization Year Book, 1940, p. 41.

† Loading Machine Guard. G. E. Stacey, Coal Mine Modernization Year Book, 1940, p. 350.

†† Shuttle Car Haulage with Mechanical Loading. H. S. Gay, Coal Mine Modernization Year Book, 1940, p. 33.

* Gathering Haulage for Mechanical Loading. G. B. Southward, Mining Congress Journal, November, 1940, p. 48. Service Haulage for Mechanical Loading, G. B. Southward, Mining Congress Journal, July, 1940, p. 41; December, 1940, p. 48.

† Time Study for Mobile Loading Machines. W. R. Cuthbert, Coal Mine Modernization Year Book, 1940, p. 252.

†† Conveyor Mining Plans. T. F. McCarthy, Coal Mine Modernization Year Book, 1940, p. 262.

††† Duckbill Mechanical Loading. V. D. Picklesimer, Coal Mine Modernization Year Book, 1940, p. 61.

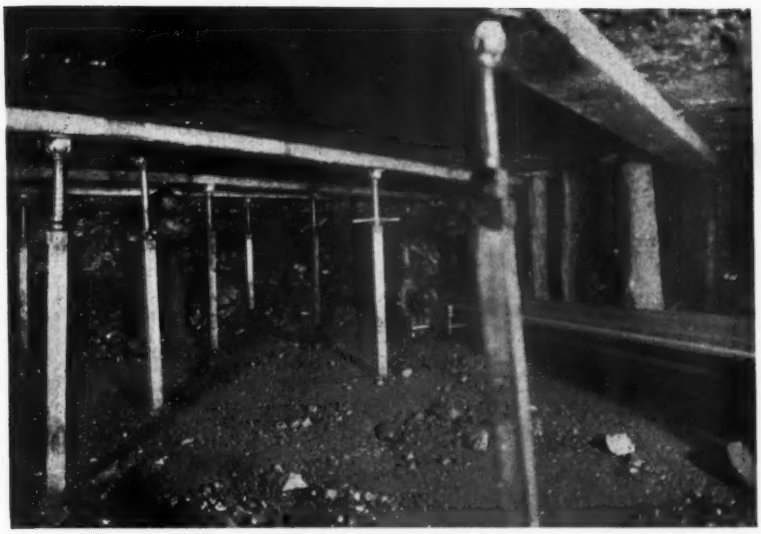
‡ Successful Pillar Recovery with Mobile Loaders. J. M. Connor, Coal Mine Modernization Year Book, 1940, p. 50.

§ Service Haulage Tracks for Mobile Mechanical Loaders. R. V. Clay, Chairman, Coal Mine Modernization Year Book, 1940, p. 256.

‡‡ Reports on Surface and Underground Substations. F. L. Stone and F. P. Brightman, Mining Congress Journal, March, 1940, pp. 44-45.

Maintenance

There has been a general improvement in maintenance of equipment for it is recognized that with multiple shifting and with equipment exposed to severe usage, coal and rock dust, and sometimes to dripping water and mud the "wear and tear" is much more serious than in the mine single-shifted on the old basis. Scheduled cleaning, lubrication, inspection and overhauling is standard practice in well-managed mines. It may be noted also that there has been continuing improvement in the quality of materials and supplies used, for it is recognized that the expenditure for these items of operating expense are apt to be much less than those resulting when there are interruptions in production due to breakdowns.*



Steel roof jacks make for safety

Safety

Improved practice in the operation of mobile loaders and conveyors is being secured by improved supervision, inspection and maintenance of equipment and education of the employes. Special Safety Rules have been formulated by Committee on Safety and these have served to stimulate discussion and improve practice.†

Trends

In the foregoing brief review a number of points have been noted which have been stressed during 1940 at the gatherings of mining men and in the various technical and trade journals. It is difficult to single out particular items as being more important or more significant than others due to the great variety of conditions prevailing. However, without regard to districts or specific local problems, the following points appear to be outstanding:

1. There must be greater vigilance in the conduct of coal mining operations, both on the part of management and labor, in order to meet the hazards incident to the industry.

2. With the use of mobile loaders and conveyors there are great opportunities for concentration of work with the attendant responsibility of supplying adequate ventilation for the rapidly advancing entries.

3. Where cleaning plants are not available, and especially where roof conditions are difficult, there is increasing interest in conveyors.

4. Where large mine cars are not available in developed mines, except at great expense, there is increasing interest in shuttle cars in order to take full advantage of large capacity loading machines.

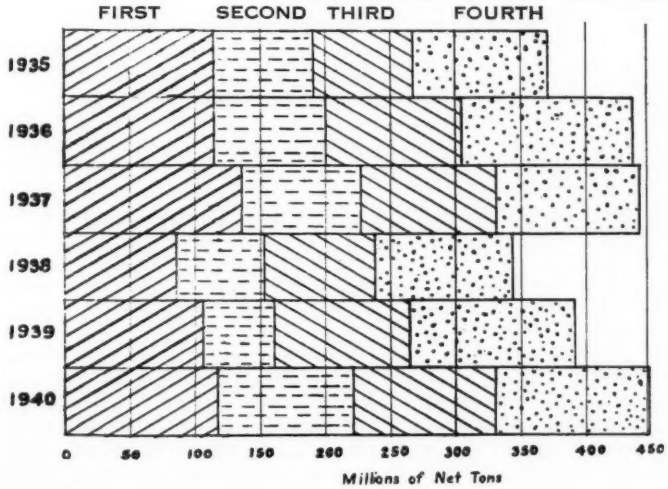
5. Due to the seasonal operation of many mines there will probably be more intensive use of the available equipment by multiple shifting; this will require provision of some standby equipment, adequate supplies and repair parts, and systematic maintenance with trained mechanics.

6. Multiple-shifting of all steps in the production cycle requires uniformly high-class supervision on all working shifts.

* Making Equipment Maintenance Pay Dividends. C. C. Ballard and K. F. Humphries, Mining Congress Journal, April, 1940, p. 30. Organization of Maintenance Crews in Mechanical Loading. C. R. Nailler, Coal Mine Modernization Year Book, 1940, p. 157. Breakdown Prevention Through Machine Inspections and Service Records. C. McCormack, Jr., Coal Mine Modernization Year Book, 1940, p. 165.

† Mining Congress Journal, April, 1940, pp. 66-67.

QUARTERLY PRODUCTION OF BITUMINOUS COAL 1935-1940 incl.



—From chart by National Coal Association

Bird's-eye view of a modern colliery in the anthracite field

The ANTHRACITE INDUSTRY in 1940*

● ***Anthracite production shows small decrease but the industry has improved position.***

By F. M. SHORE
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PRELIMINARY estimates of Pennsylvania anthracite production in 1940 indicate an output of 50,052,000 net tons. Compared with 51,487,377 tons produced in 1939 this represents a decrease of between 2 and 3 percent. It is also below the level of 1937, when 51,856,433 tons were produced, but is an increase of about 8 percent over the 1938 output. These figures do not take into account the production of "bootleg" or illicit coal, which has been estimated as at least 4,000,000 net tons in 1940.

Despite the small decrease in production indicated, several developments in 1940 are believed to have benefited the industry. The voluntary anthracite-production control or allocation plan was approved by the Governor of Pennsylvania in January and with the cooperation of the mine operators and the United Mine Workers of America has doubtless helped to bring production in closer alignment with current demand. Moreover, from such data as are available it seems probable that the industry realized higher prices at the mine for the output in 1940 than in 1939. In addition, a committee of operators and miners has been working on the problem of "bootleg" or illicit coal with the hope of formulating a workable plan for its solution.

* Published by permission of the Director, Bureau of Mines, U. S. Department of the Interior.

The Anthracite Program

For several years there has been much discussion and several plans have been under consideration which, it was thought, might bring some measure of relief to the sorely pressed anthracite industry. The present voluntary production-control program is the result of many conferences between Pennsylvania state officials, representatives of the United Mine Workers of America, and committees of old-line and independent mine operators. It is reported that the voluntary agreement, when submitted to the Governor, was agreed to by producers whose output was about 98 percent of the total anthracite production.

The program is supervised and controlled by the Anthracite Emergency Committee, composed of nine members appointed by the Governor. The operators, United Mine Workers of America, and the public are each represented by three members on the committee. The program is actually administered by an executive committee of three through power delegated by the Anthracite Emergency Committee.

A Producers' Advisory Board of 14 members advises and makes recommendations to the executive committee on all matters covered by the emergency program. This board advises on production requirements, taking into consideration stocks, unsold anthracite in cars at mines, and other conditions affecting the consumption of anthracite.

Each cooperating producer has been assigned a certain percentage position and may be expected to produce his percentage of the total tonnage which has been allocated for the week. The percentage positions were determined

by careful study of the production history of each mine by committees of operators and miners.

Anthracite Institute

The Anthracite Institute carried on its usual functions and information services. It participated actively in opposing the reduction of tariffs on oil commodities, the extension of natural-gas pipe-lines into eastern markets, and hydro-electric projects in competition with anthracite.

Labor

There were no major labor disturbances in the anthracite industry during 1940. The wage agreement between the anthracite mine operators and the United Mine Workers of America, which was effected in May 1939, expires April 30, 1941.

Federal Legislation

House Resolution 564, introduced by Representative Flannery of Pennsylvania, on August 6, 1940, proposed creating a special committee to study the anthracite emergency program. Pursuant to the provisions of this resolution, a committee of three members was authorized and directed to make a study of the program, its operations and effects. Representatives Flannery and Fenton, of Pennsylvania, and Flaherty, of Massachusetts, were designated by the Speaker of the House to serve on this committee.

Distribution and Stocks

According to the Pennsylvania State Department of Mines the total tonnage of anthracite mine shipments by rail and truck to destinations in the United States during 1939 was 44,869,453 net tons. Of this total, the truck shipments were 4,824,537 tons or about 11 percent. Of the rail shipments 63 percent were domestic sizes and 37 percent steam sizes. For the first 10 months of 1940 the total shipments were 37,031,970 tons compared with 37,320,948 tons for the same period in 1939. Truck shipments for the January-October period of 1940 amounted to 4,866,640 tons or more than for the entire 12 months of 1939. On a percentage basis the truck shipments comprised 13.1 percent of the total shipments for the first 10 months of 1940 compared with 10.1 percent for the same period in 1939. The figures on trucked coal neither include illicit or "bootleg" coal, which, as stated before, has been estimated at more than 4,000,000 tons, nor the output of dredge or river coal. There is no doubt that the trucking of coal is increasing and that the railroads are not transporting the high percentage of shipments that they did at one time.

For many years New England, New York, New Jersey, and Pennsylvania have received most of the total rail shipments. In 1939 these States received 37,643,693 tons or 94 percent of the anthracite shipped by rail. According to the Commonwealth of Massachusetts, Division on the Necessaries of Life, receipts of anthracite into New England, rail and tide (including imports), for the first 11 months of 1940 were 4,514,980 net tons compared with 4,567,755 in the same period of 1939. All rail receipts in New England for the same period in 1940 were 3,742,473 net tons against 3,747,723 in 1939.

No data on consumer stocks of anthracite for the year 1940 as a whole are as yet available. On December 1, according to the latest records in the Bureau of Mines, stocks of anthracite held by railroads (class I), electric power utilities, and other industrial consumers totaled 1,564,677 tons. On the corresponding date in 1939, stocks held by the same group of consumers amounted to 1,530,246 tons. The stocks of anthracite on the Upper Lake docks on December 1, 1940, were 258,832 net tons compared with 329,328 tons on December 1, 1939. The consumption of anthracite by class I railroads and electric power utilities for the first 11 months of 1940 was 3,474,246 net tons compared with 3,569,517 for the same period in 1939, a decrease of 2.7 percent.

Higher Prices

Prices were generally higher in 1940 than 1939. Quotations from trade journals show that average circular f.o.b. mine prices for November 1940 were $6.25 for stove size and $3.50 per net ton for buckwheat No. 1. This compares with $5.74 and $3.44 for the same month in 1939. For December 1940, the prices were $6.25 and $3.50 per net ton compared with $5.55 and $3.40 for December 1939.

According to the United States Department of Labor, Bureau of Labor Statistics, the retail prices for stove size on November 15, 1939, in Boston, New York City, and Washington, D. C., were $13, $10.69, and $12.65, respectively. On the same date in 1940 comparable prices were $13.75, $11.71, and $12.95. At the same periods the prices for buckwheat No. 1 in these three cities were $9.75, $7.54, and $9.55 in 1939 compared with $10, $8.36, and $9.60 in 1940. The prices are for a net ton of 2,000 pounds in Boston and New York and a gross ton of 2,240 pounds in Washington, D. C.

Illicit Coal

One of the most difficult situations with which the industry has had to contend in recent years is the illicit or "bootleg" coal industry. The illicit coal trade first started during the depression years when idle miners dug coal from land owned by the anthracite operating companies to heat their own homes; but it soon grew beyond this phase, and it was not long until trucks were hauling the coal to cities some distance from the anthracite fields, where it was sold in competition with the legitimate product. A survey by the Pennsylvania Department of Mines in the latter part of 1939 showed that 2,500 "bootleg" holes were in operation. The report indicated that these operations employed approximately 9,000 men and had an average daily production of 19,000 net tons. The production was prepared at 337 breakers valued at $600,000 with a capacity of 30,000 tons a day. Illicit production of coal was estimated at 3,500,000 to 4,000,000 tons, or about 8 percent of the total output in 1939. It is reported that this industry is still increasing its output and, whereas it was originally confined to the Southern region it has recently spread to the Northern field. According to the Anthracite Institute, the illicit production for 1940 was more than 4,000,000 net tons.

In an attempt to find some solution to this problem a committee of operators and representatives of the United Mine Workers of America have been considering a plan which they hope will alleviate the situation. According to press reports the general plan is to employ in legitimate operations the old-time miners who are engaged in "bootleg" operations, the companies giving jobs to the men to receive an increased allocation of tonnage from the Anthracite Emergency Committee. An effort would be made, under the plan, to find employment for those miners who are not absorbed by the legitimate operations.

The legitimate operators are looking hopefully toward satisfactory settlement of the problem, as the growth of the illicit trade has brought serious consequences. For example, in general, it is said that the preparation of the illicit product is poor, and its sale has a bad effect upon the anthracite

market. Then, too, the lack of safety standards at illegitimate operations is reported to have caused an increasing number of fatal accidents. The State Department of Mines estimates that 58 deaths occurred at "bootleg" holes in 1939. Solution of the problems arising from the illicit coal trade is, therefore, considered one of the major issues that the industry faces in 1941.

Mechanization

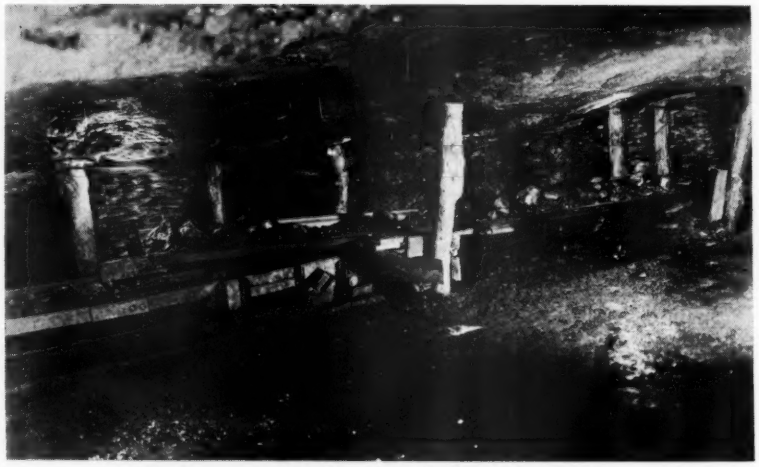
Of the deep-mined production in 1939, 11,773,833 net tons (27.7 percent) were loaded mechanically. This compared with 10,151,669 tons (26.6 percent) in 1938. Strip-pit operations produced 5,486,479 net tons of the fresh-mined anthracite in that year, while in 1938 this source had supplied 5,095,341 net tons. No comparable data for 1940 are as yet available, but preliminary information based upon sales of mechanical loading equipment in the anthracite fields indicates further mechanization of the mines. The sales of equipment are analyzed in the article entitled "Sales of Mechanical Loading and Cleaning Equipment for Use in Coal Mines in 1940" in this issue.

Research Continues

Research was continued within the industry and, as provided in the Miller Bill passed by the Pennsylvania General Assembly in 1939, the program of research in the School of Mineral Industries of Pennsylvania State College is well under way, and much valuable information has been obtained. The college staff is giving special consideration to the use of anthracite in generating water gas. Other research within the industry deals principally with new uses for anthracite or its products, more efficient use of the product in present burning equipment, and the advancement of modern heating and regulating equipment meeting the approval of Anthracite Industries, Inc.

Mechanical Stokers

Factory sales of mechanical stokers for burning anthracite have changed little in the last 3 years. Sales of class I stokers (capacity under 61 pounds of coal per hour) for the January-November period, 1938, 1939, and 1940 were 12,080, 11,097, and 11,246 units, respectively. Sales of the class II stokers, capacity 61 to 100 pounds of coal per hour, for the 11-month period in 1940 were 963. Data on class II stokers for previous years are not available.



Discharge end of shaking chute, feeding belt conveyor

Imports and Exports

Imports of anthracite into the United States for the first 11 months of 1940 totaled 115,026 net tons. Of this tonnage, 112,112 net tons came from the United Kingdom and 2,914 tons from Canada. In the same period of 1939 the total imported was 290,754 net tons. Of the 1939 tonnage, 59,498 tons originated in the United Kingdom, 6,999 in Canada, 212,444 in Russia, 20 in China, and 11,794 in French Indochina. The European war has had a definite effect on both the quantity imported and the source of supply.

In 1939 total exports of anthracite were 2,590,000 net tons and represented about 5 percent of the total commercial production. Of the total exports Canada received 2,577,157 tons (99.5 percent). For the first 11 months of 1940 total exports were 2,496,507 tons; 2,455,755 tons went to Canada. For the same period in 1939, the total was 2,473,108 tons; Canada received 2,461,145.

It is evident that neither the anthracite export nor import trade in 1940 has been unfavorable to the Pennsylvania anthracite industry when compared with the record of 1939. Exports in 1939 were greater than in any other year since 1929, when 3,406,369 tons were exported, but were far below the record year of 1917, when the total was 6,007,306 tons.

Adequate timbering precedes other face operations

SALES of Mechanical LOADING and CLEANING† Equipment for Use in Coal Mines in 1940

By W. H. YOUNG
R. L. ANDERSON
G. A. LAMB
F. M. SHORE*

CAPACITIES for mechanical loading and cleaning of coal were substantially increased by the sales of new equipment in 1940. The total production of mechanically cleaned bituminous coal in 1938, the latest year for which data are available, was 57,998,341 net tons at the mines and 5,456,247 tons at central washeries, a total of 63,454,588 tons. Production of mechanically loaded coal in 1938 was 85,092,836 tons at underground bituminous mines and 10,151,669 at underground anthracite mines, or a total of 95,244,505 net tons. The estimated capacity of mechanical loading equipment introduced in bituminous coal mines was 11.6 percent greater in 1940 than in 1939. The total number of units sold to bituminous mines increased from 1,407 to 1,845 during the same period, and the grand total for bituminous and anthracite increased from 1,631 to 2,037 or 24.9 percent.

Source of Information.—The data on mechanical cleaning of bituminous coal are compiled from reports courteously furnished by manufacturers of mechanical cleaning equipment for use at bituminous coal mines, supplemented with data from various trade journals.

The figures on mechanical loading are based upon reports courteously supplied by all known manufacturers of mechanical loading machinery for underground use in coal mines. The number of manufacturers reporting in 1939 was 31. One manufacturer which reported that it had gone out of business in 1939 was dropped from the list, and 3 were added, making a total of 33 firms canvassed for the year 1940. (Data for one manufacturer was not received in time to be included.)

Mechanical Cleaning of Bituminous Coal

Reports on sales of mechanical cleaning equipment show that installations were made in 13 states at bituminous mines during 1940. Although these sales were made during 1940, some of the plants will not be completed until early in 1941. The total capacity of cleaning plants sold in 1940 is estimated at 12,000 net tons of cleaned coal per hour. Installations at mines not previously having cleaning plants accounted for 60 percent of the total capacity, and additional equipment at mines with previous cleaning equipment accounted for the other 40 percent. About 90 percent of the total capacity of the 1940 sales was reported from wet-washing plants, and the other 10 percent from pneumatic cleaning plants. The largest number of installations was reported by West Virginia, with Indiana, Illinois, Pennsylvania, Alabama, and Ohio, following in the order named. In terms of capacity, Indiana is the greatest, with West Virginia, Illinois, Ohio, Pennsylvania, and Alabama, following.

Mechanical Loading of Bituminous and Anthracite

Total Units Sold by Type.—The number of mobile loaders sold during 1940 amounted to 233, as compared with 292 in 1939, a decrease of 20.2 percent. This is the lowest number of annual sales recorded since 1935, when only 115 units were sold. The peak year of sales for mobile loaders was 1936, when 344 sales were made.

Sales of scrapers increased from 26 in 1939 to 39 in 1940, or 50 percent. This is the highest record of sales for scrapers since 1933, when 65 were recorded.

Sales of conveyors registered an all-time high in 1940, with a record of 1,762 sales, an increase of 34.4 percent over 1939. The conveyor unit sales' figures include both hand-loaded types and those equipped with duckbills or other self-loading heads. In counting sales of duckbills and shaker conveyors on which they are used, there is a certain overlapping of sales, the extent of which cannot be accurately determined. The number of duckbills cannot be shown separately without disclosing the figures of individual companies, but it can be said that they are finding acceptance in several new fields.

Sales of pit-car loaders increased from 2 in 1939 to 3 in 1940. Table 1 shows the number of units of mechanized loading equipment sold to bituminous and anthracite mines as reported by manufacturers for the years 1933 to 1940, inclusive, with percent of increase or decrease in 1940 over 1939.

TABLE 1.—UNITS OF MECHANIZED LOADING EQUIPMENT SOLD TO BITUMINOUS AND ANTHRACITE MINES, AS REPORTED BY MANUFACTURERS, 1933 TO 1940, INCLUSIVE [1]

	1933	1934	1935	1936	1937	1938	1939	1940	Percent Increase (+) or Decrease (—) 1940 over 1939
Mobile loaders	41	55	115	344	292	241	292	233	—20.2
Scrapers [2]	65	34	22	28	29	10	26	39	+50.0
Conveyors [3]	396	610	681	994	1,095	990	1,311	1,762	+34.4
Pit-car loader	18	26	28	11	32	139	2	3	+50.0

[1] The figures for 1933 to 1936 included reports from 28 manufacturers. In 1937 one manufacturer indicated that he was no longer producing this type of equipment and accordingly was dropped from the active list; however, at the same time another manufacturer was added to the list, and the number of reporting firms remained at 28. In 1938 one manufacturer of material-handling machinery began the production of underground loading equipment and in 1939 two new manufacturers entered the field, increasing the total number reporting to 31. Figures for 1940 include reports from 32 manufacturers.

[2] Reported as scrapers or scraper haulers and hoists.

[3] Includes hand-loaded conveyors and those equipped with duckbills and other self-loading heads. As sales of both loading heads and shaker conveyors are counted, the figures involve a certain measure of overlap, which cannot be determined accurately. It should also be noted that a small number of conveyors sold in recent years, particularly in 1936 to 1938, were for use in conjunction with mobile loading machines.

† Printed with permission of the director of the Bureau of Mines.

* Messrs. Young, Anderson, and Lamb are members of the Economics Branch, Bituminous Coal Division, U. S. Department of the Interior. Mr. Shore is Acting Chief Engineer, Coal Economics Division, U. S. Bureau of Mines.

Total Sales by States.—Shipments of mechanical loading devices were made to 18 states in 1940. Table 2 shows the total number of units placed in each state or region. In a few instances separate figures are not shown for each state to avoid disclosing the business of individual manufacturers. Types of equipment in approximate order of capacity are shown by letter symbols. For example, in West Virginia 802 units of loading equipment were sold. In this aggregate of new equipment sold, conveyors (indicated by "C") furnished the largest addition to capacity, followed by mobile loading machines ("L"), scrapers ("S"), and pit-car loaders ("P"). There was a total of 1,845 units of all types shipped to bituminous mines and 192 to anthracite mines in 1940.

Types of Machines Sold Compared with Units in Use in Bituminous Mines.—The change in demand for different types of mechanical loading equipment is shown in Table 3. The number of mobile loaders in active use in 1930, as reported by mine operators, was 545. This increased to 1,405 in 1938. Sales of mobile loading units in 1939 and 1940 were 292 and 233, respectively. The sales in these two years were 37.4 percent of the total number in use in 1938.

Scrapers in use from 1930 to 1938 decreased from 150 to 117, or 22.0 percent, and the total sales in 1939 and 1940 were 18 and 36, respectively, or 46.2 percent of the number in use in 1938. Pit-car loaders in use decreased from 2,876 in 1930 to 1,392 in 1938, or 51.6 percent. Sales of pit-car loaders in 1940 continued at a very low rate, with 3 sales reported for the entire bituminous industry.

TABLE 2.—TOTAL NUMBER OF UNITS OF MECHANIZED LOADING EQUIPMENT SHIPPED FOR USE IN EACH STATE OR REGION IN 1940

(L—Mobile loading machines; P—Pit-car loaders; S—Scrapers; C—Conveyors and duckbills)

	Number of units of all types shipped in 1940	Types of equipment in approximate order of capacity in 1940
Northern Appalachian States:		
Pennsylvania	326	L.C.S.
Ohio and Michigan	206	C.L.S.
Southern Appalachian States:		
West Virginia	802	C.L.S.P.
Virginia	47	C.L.
Kentucky	152	C.L.
Alabama	70	C.L.S.
Tennessee	26	C.
Middle Western States:		
Illinois	34	L.C.P.
Indiana	29	L.C.
Trans-Mississippi States:		
Arkansas and Oklahoma	35	C.
Iowa	27	C.L.
Colorado	52	C.L.P.
New Mexico, Utah, and Montana	13	L.C.
Wyoming	26	C.L.
Total bituminous	1,845	C.L.S.P.
Pennsylvania anthracite	192	C.S.
Grand Total	2,037	C.L.S.P.

The first year for which data on both self-loading and hand-loading conveyors are available is 1933, when 657 machines were in use. In 1938 this had increased to 1,872. Sales in 1939 and 1940 were 1,095 and 1,573, or 42.5 percent greater than the total number in use in 1938.

Types of Machines Sold Compared with Units in Use in Anthracite Mines.—The change in demand for different types of mechanical loading equipment for use in anthracite mines is also shown in Table 3. The total number of units of mechanized loading equipment in use at anthracite mines increased from 805 in 1930 to 2,376 in 1938. Detailed figures are shown for the years 1931 to 1935, inclusive, but certain items have had to be combined in other years to avoid disclosing individual operations. The total sales in 1939 and 1940 were 224 and 192, respectively, or 17.5 percent of the number in use in 1938.

Types of Equipment Purchased by Regions in 1940.—Table 4 shows the number of mobile loaders, scrapers, and conveyor units shipped into each state in 1939 and 1940, and the number of units in actual use in 1938. All of the 233 mobile loaders sold in

TABLE 3.—SALES OF MECHANIZED LOADING EQUIPMENT IN 1939 AND 1940 COMPARED WITH TOTAL NUMBER OF MACHINES IN ACTIVE USE IN PRECEDING YEARS

	Number of machines in active use, as reported by mine operators [1]								Number of machines sold as reported by manufacturers	
	1930	1931	1932	1933	1934	1935	1936	1938	1939	1940
Bituminous mines:										
Mobile loading machines	545	583	548	523	534	657	980	1,405	292	233
Scrapers	150	146	128	93	119	78	106	117	18	36
Pit-car loaders	2,876	3,428	3,112	2,453	2,288	2,098	1,851	1,392	2	3
Conveyors equipped with duckbills and other self-loading heads	140	165	159	132	157	179	234	346	[3] 1,095	[3] 1,573
Hand-loaded conveyors—number of units	[2]	[2]	[2]	525	574	670	936	1,526		
Anthracite mines (Pennsylvania):										
Mobile loading machines	384	5	11	18	14	1		[4]	....	....
Scrapers		457	479	455	517	507	504	545	8	3
Pit-car loaders		28	24	19	25	22		....	....	....
Conveyors equipped with duck-bills and other self-loading heads	421	1	17	12	13	30	1,790	[4] 1,831	[3] 216	[3] 189
Hand-loaded conveyors—number of units		547	818	940	1,338	1,563				

[1] Data for 1937 not available for bituminous mines. Minerals Yearbook 1939, page 857, shows 539 scrapers and 1,855 conveyors and pit-car loaders including a few mobile loaders in the anthracite mines for 1937.
[2] Number of units not reported in these years.
[3] Reported as face conveyors (hand-loaded), "shaker drives," and "duckbills." The figures of numbers sold in 1939 and 1940 are not exactly comparable with the number in use in 1938, because of uncertainties in defining what constitutes a conveyor and because of certain overlaps in the reporting of duckbill loading heads and shaker conveyors.
[4] Mobile loading machines included with conveyors and pit-car loaders.

1940 were for use in bituminous mines. The largest number of these went to Pennsylvania, with West Virginia, Ohio, and Kentucky, following in the order named.

There was a total of 39 scraper units sold in 1940, 36 of which went to the bituminous mines and 3 to the anthracite. West Virginia received the greatest number of these units, with a total of 18; Alabama followed with 10; Pennsylvania bituminous, 7; Pennsylvania anthracite, 3; and Ohio, 1.

The Southern Appalachian fields continued to be the largest market for conveyor units. In 1940, sales to the Southern Appalachian states of conveyors of all types including those equipped with duckbills amounted to 981, compared with 681 in 1939, an increase of 44.1 percent.

Sales of all types of conveyors in the Northern Appalachian states rose from 270 in 1939 to 407 in 1940, an increase of 50.7 percent. The Trans-Mississippi states and the Middle Western states also showed increases in 1940 over 1939.

Number of Bituminous Coal Companies Purchasing Loading Equipment in 1939 and 1940.—Mechanization continued to spread to new fields and new companies in 1940. Table 5 shows the number of bituminous coal mining companies using mobile loaders in 1938 and purchasers of this equipment in 1939 and 1940, by states.

There were 218 companies using mobile loaders in 1938. Of the 104 companies buying mobile loaders in 1939, 68 had used these before, while 36 companies were installing them for the first time. In 1940, 27 new companies began using mobile loaders, and 56 bought additional equipment. West Virginia furnished the greatest number of companies purchasing mobile loaders for the first time in 1940.

Although data on sales of conveyor equipment are not sufficiently detailed to allow a separation between "former users" and "new users," it is evident that conveyors likewise went to many new users in 1940.

Trackless Gathering Equipment.—Sales of self-powered rubber-tired trackless haulage units continued to advance during 1940. Installations were made in 9 states during the year. These units consist of a shuttle car or a tractor-trailer, which are generally propelled by storage batteries (few cable-reel units are in use). These units are employed to haul the coal from the mobile loader to a transfer station located on the haulageway. The transfer of the coal from the shuttle car or trailer into the mine cars may be effected by means of a ramp, hopper, or an elevating conveyor.

TABLE 4.—COMPARISON OF MOBILE LOADERS, SCRAPERS, AND CONVEYORS IN ACTUAL USE IN 1938 WITH SALES REPORTED IN 1939 AND 1940, BY REGIONS

	Mobile Loaders			Scrapers			Conveyors [1]		
	In use in 1938	Sales in 1939	Sales in 1940	In use in 1938	Sales in 1939	Sales in 1940	In use in 1938	Sales in 1939	Sales in 1940
BITUMINOUS									
Northern Appalachian States:									
Pennsylvania	164	89	94	32	1	7	476	225	225
Maryland	...	...	...	...	...	...	...	...	...
Ohio	70	17	23	...	...	1	29	45	178
Michigan	...	...	...	...	...	...	...	...	4
Southern Appalachian States:									
Alabama	23	7	6	32	8	10	134	82	54
Kentucky	47	28	18	...	...	...	117	131	134
Tennessee	3	...	...	9	...	...	43	41	26
West Virginia	266	85	59	...	9	18	443	375	724
Virginia	27	8	4	...	...	...	...	52	43
Middle Western States:									
Illinois	504	28	8	...	...	...	37	28	25
Indiana	158	12	7	...	...	...	...	2	22
Trans-Mississippi States [2]	143	18	14	44	...	...	593	114	138
Total bituminous	1,405	292	233	117	18	36	1,872	1,095	1,573
ANTHRACITE									
Pennsylvania	[3]	...	...	545	8	3	[3] 1,831	216	189
Grand total	1,405	292	233	662	26	39	3,703	1,311	1,762

[1] Includes hand-loaded conveyors and conveyors equipped with duckbills or other self-loading heads.
[2] Includes Arkansas, Colorado, Iowa, Montana, New Mexico, North Dakota, Oklahoma, Utah, Washington, and Wyoming.
[3] Mobile loaders and pit-car loaders included with conveyors.

TABLE 5.—NUMBER OF BITUMINOUS COAL-MINING COMPANIES USING MOBILE LOADERS IN 1938 AND NUMBER OF COMPANIES PURCHASING EQUIPMENT IN 1939 AND 1940

(Based upon records covering 86 percent of the total sales in 1939 and 84 percent in 1940)

	Users in 1938	Purchasers in 1939		Purchasers in 1940	
		Former users	New users	Former users	New users
Northern Appalachian States:					
Pennsylvania	27	13	7	16	6
Maryland	..	..	..	..	..
Ohio	8	3	3	2	4
Southern Appalachian States:					
West Virginia	59	21	10	15	9
Virginia	9	1	4	2	..
Kentucky	22	10	3	5	3
Tennessee	3	..	1	..	..
Alabama	8	3	1	1	2
Middle Western States:					
Illinois	35	8	1	4	..
Indiana	23	5	1	4	..
Trans-Mississippi States:					
Arkansas	1	..	..	..	..
Colorado	7	..	2	1	1
Iowa	..	..	1	..	1
Montana	5	1	..	1	1
New Mexico	2	..	..	1	..
North Dakota	..	..	..	..	..
Oklahoma	..	1	..	..	..
Utah	6	1	1	2	..
Washington	..	..	..	..	..
Wyoming	3	1	1	2	..
Total	218	68	36	56	27

Pennsylvania Legislature May Act On Anthracite Price Bill

An act to fix the prices of anthracite at the mines may be submitted to the Pennsylvania Legislature, Chairman Harry O'Neill of the State Mines and Mining Committee, disclosed in January. The measure is being written by operators of the eastern Pennsylvania fields.

The primary purpose of the legislation, said O'Neill, is to establish flat prices on the product as it leaves the collieries and thus "prevent cut-throat price competition."

"The operators have been selling at the same fixed prices since they adopted the voluntary allocation plan and as a result they're making money for the first time in years," he said.

SAFETY in Coal Mining

By J. T. RYAN
Mine Safety Appliances Co.

Increased production of mines demands increased precautions against accidents. Mr. J. T. Ryan reviews the record of the past year and points the course to be followed in the future.

IT IS particularly appropriate at this time to review the safety work of the coal mining industry in view of the disastrous record in fatalities from gas and coal dust explosions in bituminous coal mines during the past year in which there were 288 fatalities from this cause, of which 276 were the result of major explosions in which 5 or more men were killed. In fatalities from explosions the year 1940 was the worst year since 1928, a 12-year span.

Anthracite Mines Have Excellent Record

The anthracite mines, however, show an excellent record in not having suffered a major mine explosion for more than 2 years. Records for 11 months of 1940 show that the hard coal operations reduced their fatal accident rate from 4.11 lives lost per million tons of coal mined in 1939 to 3.59 for 11 months of 1940.

Despite the increase in fatalities from gas and coal dust explosions in bituminous mines, the fatality rate did not rise as much during the 11 months of 1940 for which records are available as might have been expected. The rate for this 11 month period was 2.71 fatalities per million tons of coal as against 2.52 for all of 1939. In fact, when there is deducted the 268 lives lost in major disasters during the first 11 months of 1940, the fatality rate becomes 2.12 fatalities which would have constituted an appreciable reduction from the 1939 rate.

According to the latest available figures, fatal accidents due to the following causes show a materially lower fatality rate than in a similar period in 1939: Falls of roof and coal; electricity, machinery and shaft accidents.

Record in Bituminous Mines Calls for Renewed Determination to Prevent Fatalities

The brief review of the fatality record of the past year given above merits the attention of every coal mining official. The inclusion of all officials in this statement, not only operating officials, is important. Too often responsibility for safety is placed entirely upon the operating officials and, yet, unless safety is considered by the entire management to be a matter of major concern it will not be of great importance in the day to day management of the mine.

Top management determines the direction and control of the major policies of the company. What they think are major items of importance in an organization will be reflected in the emphasis given these items by the operating personnel under them. As a sound beginning in any safety program the management must take positive steps to indicate to everyone in their organization that safety is the major concern of their company. Given this firm backing, operating officials can with confidence make recommendations and enforce decisions pertaining to safety.

Considered in the light of the figures above, the problem of safety in coal mines is a matter of control of two groups of hazards: those which produce major disasters; and those resulting in individual fatalities. Much attention has been devoted to the latter and certainly has been productive of good results.

The lesson of 1940 is quite definite, however, in warning us that in operating coal mines we must not overlook two basic hazards: gas, and coal dust. These hazards are always with us and must at all times be kept under close control or a major disaster of wide proportions can occur.

Much serious thought and considerable frank discussion have been devoted to this matter of prevention of gas and coal dust explosions during this past year. Excellent papers were presented at the 17th Annual Coal Convention in Cincinnati, at many coal mining institutes throughout the bituminous coal producing districts, and within many company organizations.

Improved Mining Methods Demand Improved Safety Precautions

Mechanization and the problems which it presents have been the subject of many of these discussions. It is clear that increased mechanization

Careful work at the face is a prime consideration for safety

does have an effect on the two major hazards, gas and coal dust, and every company operating or planning to operate mines with increasing degrees of mechanization must carefully consider the extent to which their particular program will change their conditions in respect to gas and coal dust over that with which they had been familiar under their previous methods of operation.

The use of mobile loaders, conveyors, scrapers and other forms of mechanical equipment permit more rapid advance of work into solid coal and result in a greater amount of gas which must be handled during the working shift. Coupled with the increased use of electricity at the face, this increased liberation of gas constitutes a serious problem. To meet this hazard in 1940, greater attention has been given to ventilation and the use of permissible equipment.

Mechanized mining requires not only more but better controlled ventilation. With rapid rates of advance, conditions which affect ventilation can change very quickly in one section. Thus, frequent and careful inspections are necessary to check accurately the amounts of gas being liberated in each section, the quantity of air being provided, and its proper control. Modern developments in portable methane indicators greatly simplify and improve previous methods of gas analysis and permit this work to be done conveniently and rapidly. During the past year there has been developed a Methane Alarm, which is now undergoing extensive field tests. This instrument is wholly self-contained and gives an immediate indication of the development of a dangerous methane concentration by means of a visible or audible signal.

Permissible equipment has received an increasing degree of attention during the past year, particularly from the standpoint of maintenance. One of the lessons from the explosions occurring last year has been the necessity for proper maintenance of permissible equipment at all times as such equipment is only permissible when it is maintained in its original safe condition.

Hand loading is still an important factor

Coal Dust Great Hazard

The coal dust hazard must be given further attention in mechanized mines. The mechanical loading and handling of coal develops more coal dust and a type of coal dust that is hazardous, the fine coal dust that will enter into an explosion. The principal methods recognized for control of the coal dust hazard are: rendering the dust inert after it is developed; keeping down its development; and taking care of it at the source by wetting. All three methods must be used. Systematic rock dusting, particularly of back entries, is necessary to provide general protection to the mine; while the points at which dust is likely to be generated at the working face or conveyor discharge points must be protected by wetting, local rock dusting and other means.

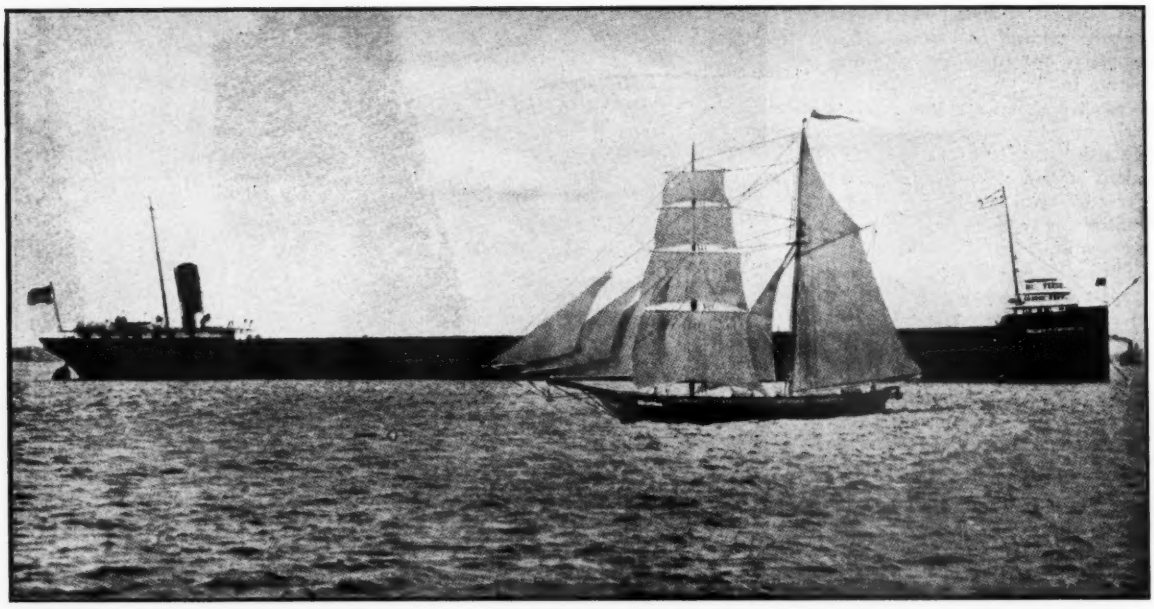
The matter of back entries has been given close consideration during 1940 as their condition has an important bearing upon the two problems discussed; namely, ventilation and rock dusting. It is being recognized more clearly than ever before that back entries must be closely inspected so as to be kept clear of falls and properly rock dusted.

As the result of the six major disasters that occurred last year, considerable interest has been shown in the self-rescuer, which was approved by the Bureau of Mines in 1924. Since approximately 48 percent of all men losing their lives in mine disasters die as a result of the after-damp rather than from the force of the explosion, many companies are now requiring that all men underground be equipped with self-rescuers.

The most important lesson as to coal mining safety that was brought out during the past year has been the necessity for continual alertness on the part of everyone connected with coal mining. It has been conclusively shown that vigilance cannot be relaxed for even a short period of time without the possibility of an explosion. In the face of the bad fatality record shown by the industry during the past year, it is gratifying to note the intelligence and energy which coal mining officials are devoting to the problem of improving the safety of their mines, and it is to be hoped that the year 1941 will show a greatly improved record as a result of their efforts.

Report Recommends Treatment For Utah Coal

The state-financed Utah Conservation and Research Foundation has issued a report recommending the establishment at Salt Lake City of a semi-commercial plant for the low temperature carbonization of Utah coal. It is recommended that the plant be operated continuously for not less than one year, to determine cost of production and the possible market for products and by-products. The report states that a smokeless fuel "is urgently required for hand-fired plants, mostly domestic installation," and calls attention to the fact that stoker installations do not constitute a civic problem and that the treatment of small sizes is not considered. The report recommends certain processes, all of which are open to discussion.



CONTRAST

A modern lake cargo carrier and the historic Brigantine Columbia

War's Effect on IRON ORE

What does a million tons of iron ore mean in terms of steel products for defense? It can mean 10 large battleships, 100 auxiliary vessels including light and heavy cruisers, destroyers and submarines, and a couple of aircraft carriers. It can also mean 20,000 heavy tanks.

By H. L. PIERCE
Vice President
Hanna Iron Ore Company

IT is impossible at this time to foresee and determine the future effect of the National Defense Program on the iron ore industry, but after assembling a few facts and figures, we can come to what seem like obvious conclusions. To begin with, it might be well to analyze the source of supply and rate of consumption. The United States has four main iron ore producing regions. In the order of their importance they are—the Lake Superior region, the Birmingham District, the New York-New Jersey or Eastern region, and the scattered districts of the West.

In 1916, and again in 1929, this country reached the all-time peak for the consumption of iron ore. This was slightly over 73 million tons, although there were three years intervening in which the melt almost reached this figure. Recently the steel plants have been running at almost full rated ingot capacity, and yet the consumption for this year is estimated at only slightly over 70 million tons.

Mine Capacity Adequate

The steel plants of the Birmingham and Western Districts, working at full capacity, should have no difficulty in obtaining all their iron ore supply from their present sources. The Eastern furnaces, that have been importing from 2 to 3 million tons of ore mainly from Chile and Cuba, in case of a blockade could be supplied from the Lake Superior region, although this would entail a freight penalty. The Lake Superior region is extremely fortunate in having available on the Mesaba Range great tonnages fully developed, that can be mined by the open-pit method and where the rate of production is only limited by the amount of equipment available. Last year, in this district, there were 125 active mines shipping approximately 45 million tons. Practically the same mines have shipped as high as 66 million tons in one year, and could conservatively still further be increased another 15 percent if called upon. Such an increase could be accomplished with very little additional development work and with very little increase in the present equipment. Further, there would be no trouble in maintaining this same rate of production for several years.

Defense Requirements Can Be Met

A few authorities have ventured to estimate that our coming defense program would require 10 to 15 million tons of steel. This, of course, is pure conjecture, as it will be a matter of months before the steel industry will have any accurate knowledge of just what that tonnage demand will be. Past records indicate that 1 ton of steel is made up of slightly over 1 ton of iron ore, plus scrap and other iron bearing material, so that, roughly speaking, we can think of 1 ton of steel as being the equivalent of 1 ton of iron ore. Our defense plans call for a "two-ocean navy" and a large

ESTIMATES OF IRON ORE MINED AND SHIPPED IN THE UNITED STATES IN 1940 AND ACTUAL OUTPUT IN 1939
(Table by U. S. Bureau of Mines)

	Ore mined (Gross tons)		Ore shipped			
			1939		1940	
	1939	1940	Gross tons	Value	Gross tons	Value
Lake Superior:						
Michigan	9,159,222	12,671,000	11,238,605	$37,026,665	13,746,000	$40,769,000
Minnesota	31,547,701	47,870,000	32,370,241	97,113,591	47,949,000	121,758,000
Wisconsin	972,685	1,267,000	1,173,828	3,526,980	1,226,000	3,380,000
	41,679,608	61,808,000	44,782,674	137,667,236	62,921,000	165,907,000
Southeastern states:						
Alabama	5,960,507	7,180,000	5,985,208	9,971,024	7,180,000	12,408,000
Georgia	26,333		25,846	51,078		
Mississippi	...		...	...		
Tennessee	* 34,941	59,000	* 31,301	* 88,385	52,000	137,000
Texas						
Virginia						
West Virginia	.....		...	...		
	* 6,021,781	7,239,000	* 6,042,355	* 10,110,487	7,232,000	12,545,000
Northeastern states:						
New Jersey	399,289	657,000	394,709	1,865,037	692,000	3,321,000
New York	2,713,604	2,890,000	2,693,856	7,403,750	2,918,000	8,032,000
Pennsylvania						
	3,112,893	3,547,000	3,088,565	9,268,787	3,610,000	11,353,000
Western states	917,448	1,212,000	914,537	1,495,733	1,206,000	1,929,000
Grand total	* 51,731,730	73,806,000	* 54,828,131	* 158,542,243	74,969,000	191,734,000

* Revised figures. By Robert H. Ridgway and H. W. Davis, Metal Economics Division, E. W. Pehrson, chief engineer.

fleet of airplanes and tanks. A million tons of iron ore, which is about one month's normal operation for one of the larger Mesaba open pits, would be, in terms of steel, the equivalent of 10 large battleships, 100 auxiliary vessels including heavy and light cruisers, destroyers and submarines, with a couple of aircraft carriers for good measure. The same tonnage of iron ore would build 20,000 heavy tanks, while the ore requirements for 50,000 airplanes could be produced from one of the open pits in a few days. Obviously, such a program in itself, distributed over a period of years, would hardly cause a ripple in the iron ore production.

We all realize, of course, that the National Defense Program involves the building of munitions plants, factories, warehouses, storage tanks and munitions of all kinds. This is bound to be a large tonnage, and when taken with the normal increased demand in all lines of steel consumption attendant on general good business, it is only logical that we can expect near capacity production of the ore mines until this program is behind us.

Can Meet Increases in Demand

If there is an expansion in the steel-making capacity of the country, we repeat, that the Lake Superior region is developed and prepared at the present time, without expansion, to conservatively meet a 15 percent increase in demand, and from this point could keep pace with any reasonable increase in the steel-making capacity. In short, we are now equipped and prepared to furnish all of the ore the present furnaces can possibly melt with a comfortable margin of safety, which places us in a very enviable position in these times when other industries affected by the National Defense Program are looking to large expansion programs.

During the calendar year 1940, those blast furnaces depending principally on Lake Superior iron ore, melted approximately 62,400,000 tons, which is almost identical with the tonnage shipped during the year from the Lake Superior District. On January 1, 1941, there was slightly over 36,000,000 tons of this ore at furnaces and on Lake Erie docks, and at the December rate of melt, which was a little less than 6,200,000 tons, there would be on hand as of May 1, 1941, at which time 1941 shipments would be arriving in substantial tonnages, approximately 11,500,000 tons. This, with the possible exception of special grades for special kinds of iron, would run the furnaces for almost two full months.

Statistics of Iron Ore Industry—1940

An advance summary issued by the Bureau of Mines estimates the output of iron ore in the United States as 73,806,000 gross tons, an increase of 43 percent over the quantity mined in 1939. The output in 1940 was, except for 1916 and 1917, the largest of record. The ore shipped from mines in 1940 is estimated at 74,969,000 gross tons valued at $191,734,000, an increase of 37 percent in quantity and 21 percent in total value compared with 1939. The above figures do not include ore that contained 5 percent or more of manganese in the natural state.

The average value of the ore at the mines in 1940 is estimated at $2.56 per gross ton; in 1939 it was $2.89. The stocks of iron ore at the mines at the end of 1940, mainly in Michigan and Minnesota, were 3,502,000 gross tons, a decrease of 26 percent from 1939.

With the steel industry operating at 73 percent of capacity during each of the first quarters of 1940, advancing to 88 during the third quarter, and reaching 95 during the last quarter, thus establishing an all-time record output, operating schedules at iron-ore mines in the Lake Superior district were keyed to meet not only the 1940 requirements but to build up stocks at docks and furnaces sufficient to last until the 1941 navigation season opens. To accomplish this task, the entire ore fleet was engaged part of the season. Although severe storms on the Great Lakes in November resulted in the movement of about 2,000,000 tons less than expected, shipments down the Lakes for the season exceeded 63,000,000 tons and were the third largest of record.

On this page, accompanying Mr. Pierce's article, will be found a chart showing the output by districts.

The summary continues:

The imports of iron ore reported for the 11 months ended November 30, 1940, were 2,308,338 gross tons valued at $5,875,925, compared with 2,412,515 tons valued at $5,865,510 for the entire year 1939. The reported exports of iron ore for the 11 months ended November 30, 1940, were 1,385,792 tons valued at $4.621,099, compared with 1,057,304 tons valued at $3,578,086 for the entire year 1939. Virtually all of the 1940 exports went to Canada, while Chile supplied about two-thirds of the imports. The statistics of imports and exports were compiled from the records of the Bureau of Foreign and Domestic Commerce.

COPPER Outlook For 1941

THE American Defense Program and "unstinted aid to Britain, short of war" have galvanized into unprecedented activity our heavy industries which now have risen to the highest level ever reached in this nation's history, with large expansions in our capital facilities being planned and some already under way.

Copper shipments into consumption, as a result, have been at peak rate. Whether they will continue at that rate depends first upon the ability of Great Britain to withstand the most intense pressure that Germany will put upon her defense in 1941, and second, upon whether the bottlenecks at present developing in American production of war material can be broken quickly enough to permit this peak rate of operation to continue and to increase.

All this armament activity is strongly influencing the nation's economy. This is most fortunate, for the success with which we emerge from this war ordeal without an engulfing aftermath of business depression will depend largely upon the extent to which this enforced orgy in manufacturing means of destruction stimulates activity in the many constructive lines of industry which have lagged so discouragingly since 1929. The United States entered this armament campaign with housing, machinery, and probably everything except highways and electrical power lines, in an under-normal condition compared with adequate peace time requirements.

Copper a Vital Material in Many Industries

Due to stimulation from our war activities building construction, especially industrial and engineering, and shipbuilding, will undoubtedly attain a new high in 1941. Public utilities, especially electric power production, transportation of all kinds, and communications, notably the telephone industry, will also, in all probability, attain new peaks of activity in 1941. All these facilities will be taxed to the utmost so long as the war continues and our defense program is under way. Copper, which plays such an important part in these basic industries, will undoubtedly be drawn on heavily for these purposes.

The outcome of the first World War was in part determined by the plentiful outflow of copper from the nation's mines. The role of copper in defense today will be even more decisive not only in materials directly needed for defense but also in maintaining the ever-increasing flow of other materials "to the barricades."

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Production and Consumption at a High Rate

Although our defense program is as yet hardly started, ordnance and ordnance stores, such as brass cartridge shell cases, small arms and ammunition, are being turned out in increasing quantities. In all these, copper plays a major role. As a result, steel and copper, the main metals required in the creation and supplying of mechanized armament, are being consumed as fast as they can be produced. In fact, copper deliveries have recently been running in excess of domestic production, so that domestic stocks of copper are dwindling rapidly.

By A. H. SINGER
Sales Manager
Adolph Lewisohn and Sons, Inc.

The accompanying table, in short tons of 2,000 pounds each, shows almost stationary domestic production, sharply rising consumption, rapidly shrinking stocks and record-breaking sales for the seven months period from June to December, 1940.

This, however, need cause no alarm as Latin-America produced copper imported into the United States can supply any present or prospective need that our own mines may not be able to meet. The tonnage of copper that we shall have to import from Mexico and South America will depend upon the tempo attained in our own defense preparations, the amount

Subsidence area over a large block-caving copper mine

Production		Deliveries	Producers' Refined Stocks	Total Sales of Copper to Consumers
June, 1940	79,845	61,716	199,586	110,453
July, 1940	79,327	71,226	215,823	58,577
August, 1940	79,967	96,383	198,955	67,631
September, 1940	78,238	96,485	185,313	254,277
October, 1940	86,911	103,771	164,618	125,531
November, 1940	84,283	102,483	158,418	85,633
December, 1940	84,937	112,671	142,772	90,164

of orders for fabricated copper placed here by Great Britain and our own domestic peace-time (non-armament) industrial needs.

The scope of our defense preparations cannot be measured by the magnitude of our war appropriations. Instead, they will be determined by the speed with which we eliminate present bottlenecks as well as by the developments in the European and Far-Eastern war zones during the first half of 1941. Half of the 17 billion dollars appropriated by Congress during 1940 has already been allocated in armament orders to American industry. At the close of 1940 we were spending on war at the rate of about 450 million dollars a month. This rate is expected to be doubled sometime in 1941. Present capacity was being taxed by the high rate of operations during the last four months of this year. Further increase can be attained only by greater coordination in the utilization of the facilities that we now have while capacity is being increased.

Steady Price Structure Maintained Despite Buying Wave

Launching of the huge American defense program the middle of 1940, on top of placement here of French and English armament orders of about two billion dollars, started the biggest buying wave in steel and copper products the world has ever seen. Coming on top of small placement of orders preceding the launching of the blitzkrieg, almost hysterical fear seized those engaged in meeting normal peace-time demands, causing the price of copper to advance on the theory that defense requirements would monopolize our entire industrial capacity to the exclusion of our peace-time needs.

Sales of copper during the last seven months reached almost fabulous proportions. This, in turn, forced allocation of sales by large producers to fabricators who had not as yet bought the copper required to meet orders already actually accepted. Then the Government intervened and, after a thorough statistical study of the copper situation, brought pressure upon the copper industry to keep prices at the then-current level of 12 cents per pound. This allayed the fears of copper users sufficiently so that they are no longer attempting to anticipate their needs too far ahead.

Foreign Copper Purchases by Metals Reserve Co.

On December 20 the Government agency, Metals Reserve Co., announced the acquisition of 100,000 short tons of foreign copper produced in Latin-America, mainly in Chile, Peru, and Mexico, to be used as a stock-pile for our defense needs. Beginning with February or March, 1941, this supply will be available to copper consumers in this country who have government defense orders and who find themselves unable to obtain copper from domestic sources. This should take care of our immediate needs in excess of domestic production, and thus prevent a copper shortage from developing in the near future. No doubt, when it becomes apparent, as it probably will before long, that the above mentioned 100,000 tons of foreign imported copper will be quickly used up in this country another stock pile of the same quantity will be acquired. As Latin-America is producing about 40,000 tons per month and can produce about 50,000 tons per month, it seems very unlikely that a shortage of copper will develop in this country. On January 11, 1941, all copper, including bonded copper and copper products, in this country, were placed under export licensing control. This virtually shuts off Japan and Russia from United States and Latin-America copper and leaves the United States as the principal outlet for Latin-America copper. Great Britain, of course, has her own Empire copper and part of the Katanga production. It should also be remembered that the rate at which copper goes into filling war needs abroad depends to a large extent upon the rate of shell-fire and the destruction to British shipping, its cargoes, plants and materials destroyed by air, sea and land instruments of destruction in the war zones.

Position of U. S. Changed in Respect to World Supply

Statistics mean little in such times as these. However, during the last World War (1914-1918) the United States produced an average of 838,000 short tons of copper a year and the rest of the world, an average of 540,000 tons. The United States in 1939 produced about 882,000 tons of copper, and the rest of the world is estimated to have produced about 1,647,651 tons. The position of the United States in regard to copper production has, therefore, changed rapidly from that which it held during the last war, as then we produced about 60 percent of the world's copper while now we produce about 30 percent.

The following table gives a comparison between the 1929, 1939, and 1940 United States production and consumption in short tons of 2,000 pounds; the figures are only approximated:

Year	Production	Consumption
1929	1,179,000	1,160,000
1939	882,000	801,000
1940	990,000	1,050,000

The only new United States production in sight is that of the clay-orebody at Morenci, belonging to Phelps-Dodge, which is not expected to come into production before the end of 1941, and will add about 7,000 tons a month to our American production.

With Great Britain using practically all her Empire copper, any deficiency in our own output must be made up by importations from Chile, Peru, and Mexico, where capacity appears to be ample. But as our defense program gets under way, importations from Latin-America can be expected to increase and might even lead to the necessity of imposing priorities.

In view of this, and, as Great Britain is controlling the price of her Empire copper, and, as the United States is controlling the American price, there appears to be little likelihood that the price of copper here will increase much above present level of 12 cents a pound unless, of course, the cost of its production also increases. As to whether 12 cents is an equitable price for domestic copper lies not in the province of this article. This compares with an average price of approximately 14¾ cents a pound during the 48 years ended with 1929,

The flow of copper from modern well-equipped plants such as this is a very material factor in defense

an average of 13.31 cents in 1914, and of 29.19 cents in 1917. At one time during the last World War the United States Government fixed price at 26 cents a pound.

Following this war there promises to be not so large accumulations of copper scrap such as followed the last. From the nature of the conflict, most of the brass and copper is being recovered and re-used as fast as ammunition is fired in Europe in anti-aircraft and larger guns. This may also be a factor in keeping down the peak of copper demand during this war.

What the aftermath for copper will be following a cessation of hostilities abroad, no one can say, but, such an eventuality would, at least for the time being, throw the copper industry into a period of rapidly diminishing activity, with resulting increasing stocks and declining prices. While hostilities last, domestic copper can look far forward to full production and peak consumption.

LEAD PRODUCTION and Importation Rising

● ***Lead is in less vulnerable position than is the case with some other war minerals.***

E. R. DONDORF
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and
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TO give a comprehensive review of the effect of the war on lead supplies, the international movement of lead, the conditions of the domestic market and the probable price trend of the metal, the reader will agree, is a pretty big sized order. If we were to take each of these phases and discuss them, we might not only infringe on the space available but also tax the reader's patience. We shall, therefore, touch but very briefly on some of the outstanding features of the lead situation. At the beginning, let us say very frankly that if we are expected to play the role of prophet and predict what is in store for the market, the reader will be sorely disappointed. It is difficult enough to take a long-range view of the lead market in normal times, and only a fool would make any predictions in troublesome times like these.

Demand Raises Price

It might be well to see how the lead market fared during the first year of World War II. On September 2, 1939, just prior to the outbreak of the war, the domestic price of lead was 5.05 cents, New York. By September 6, the price had risen to 5.50 cents New York, and had it not been for the restraining influence of some of the large domestic producers who kept both feet on the ground and who were not carried away by the excitement, there is no telling how high the price might have risen. For a time it looked as though the sky might be the limit because many consumers throughout the country in greatly diversified lines of business seemed to come to the same

conclusion that they had better buy the lead while the metal was available. A virtual buying stampede resulted during which consumers appeared to be determined to buy up the stocks of lead that producers had been carrying for months. Consumers, large and small, wanted to cover their needs as much as six to eight months ahead.

The outbreak of hostilities abroad in 1939 seemed to have revived memories of what happened in the first World War when the price of lead reached as high as 12 cents a pound in 1917. Chart readers and statisticians got busy and dusted off old graphs and records to see what happened then and assumed that history would probably repeat itself. But market conditions were just about as different from what they were in 1914 as the present blitzkrieg tactics are from those that prevailed in the preceding war.

Domestic Production Smaller Proportion of World Output Now

At the outbreak of the first World War in August, 1914, the price of lead was 3.90 cents New York, and at the end of the first anniversary the price had risen to 5.25 cents. At the outbreak of the present war on September 3, 1939, the domestic price of lead was 5.05 cents, and at the end of the first anniversary it was down to 4.90 cents after having previously touched 4.75 cents. The reason for this divergent market trend is to be found in the changed world conditions as far as lead supplies are concerned. In 1914, the United States occupied a prominent position as a world supplier of lead. This country produced in 1914 about 540,000 tons of lead, whereas the world's entire output that year was only 1,272,000 tons, according to figures by the American Bureau of Metal Statistics. In other words, the United States in 1914 produced approximately 43 percent of the world's total. In contrast with that situation, the output by the United States in 1939 was 420,000 tons, whereas the world's output had risen to 1,900,000 tons, so that this country produced only about 22 percent of the world's total as against 43 percent in 1914. The obvious conclusion is that in the present war, the combatants instead of being dependent on the United States for their supplies have so much lead of their own, that not only are they self sufficient, but actually in possession of an exportable surplus.

E. R. Dondorf

Jean McCallum

The following comparisons will probably best illustrate the point: In 1914, when the first World War started, the British Empire, including Canada, Burma and Australia, produced 170,000 tons of lead according to the American Bureau of Metal Statistics. In 1939, the production from the same source had risen to 573,000 tons or more than three times as much as the 1914 total. The British Empire will not consume all the lead it produces and that of course knocks into a cocked hat all those optimistic expectations that the present war was going to create a boom in the lead market such as was experienced in the last World War. The entire production picture has changed since 1914. In that year South America produced only 3,000 tons, whereas production in 1939 amounted to 50,600 tons. Mexico's lead production figures tell the same story, a jump from 26,000 tons in 1914 to 238,000 tons in 1939. Prior to the present war, a large part of Mexico's and South America's production found its way to Germany, Holland, Belgium, and the Scandinavian countries. But with the seas infested with mines, with England blockading Germany and those countries which Germany has so ruthlessly crushed, the Mexican and South American lead producers were confronted with a very

Mine LaMotte property in southeast Missouri

serious problem, that of finding an outlet for their production. This problem was not solved with the result that stocks piled up in Mexico and South America and the United States became the repository for a good portion of foreign concentrates.

U. S. Imports

Figures compiled by the Bureau of Foreign and Domestic Commerce show that the United States imports of lead ore and matte on the basis of lead content for the first seven months of 1940 amounted to 62,147 tons, whereas in the same period of 1939 they were only 14,046 tons. In the seven months of last year we imported 9,291 tons of lead ore from Newfoundland, whereas there were no imports from that source in the same period in 1939. Argentina sent to the United States 10,488 tons of ore and Bolivia sent 2,440 tons, and Chile 4,049 tons in the seven months period from January to July, whereas in the same seven months of the previous year we imported practically no ore from these sources. We imported 13,965 tons of ore and matte from Peru in the seven months under consideration and 14,242 tons from Australia, whereas in the like period of 1939 our imports from Peru were only 4,946 tons and from Australia 3,751 tons.

Perhaps more striking are the United States imports of refined lead which in the first seven months of 1940 totalled 108,129 tons as against 1,736 tons in the same period of 1939. In contrast with these heavy imports, the United States exports of refined lead in the same seven months of last year were only 16,582 tons, whereas in the same period of 1939 they were 66,651 tons. The balance of the foreign lead that has been brought into this country and which has not been sold is probably resting in bonded warehouses, for as you know, the United States has a duty of 1.50 cents a pound on lead ore and a duty of 2.125 cents a pound on foreign refined lead that is imported into this country. The duty acts as a bar to keep out foreign metal only so long as the domestic price is at a level that makes it unprofitable to sell the foreign production in this market.

Lead in Good Position to Carry On

We do not want to create the impression that the domestic lead market is in a vulnerable condition because it is not. We have simply tried to bring home the fact that in spite of the European War we are not likely to see a repetition of market conditions such as prevailed in the first World War and we may add safely that neither the leading producers of lead, nor the consumers, would welcome a repetition of such conditions. What the industry wants is stability. Runaway market conditions, violent price fluctuations, peaks and valleys in demand are just as injurious to producers in the long run as they are to consumers.

What the future holds in store for the domestic lead market no one can accurately predict. It is reasonable to assume that the billions of dollars that our Government is spending and will continue to spend on the National Defense Program should create a good demand for lead since the metal is still an integral part of the war machine. Our own feeling is that the outlook for the future is encouraging.

Review of ZINC—Greatly Increased Production Needed This Year

By HOWARD I. YOUNG
President
American Zinc, Lead & Smelting Co.

PRIOR to 1940 a 20 percent reduction in duty of slab zinc which was made effective in the Canadian Reciprocal Trade Agreement January 1, 1939, stabilized the price at 4.5 cents per pound until mid-summer when the price advanced to 4.75 cents per pound. This condition prevailed despite the fact that the consumption of zinc during the first seven months of 1939 was 52 percent in excess of the consumption of zinc over the same period in 1938. The usual price fluctuations that prevail under similar conditions, namely: those of supply and demand did not occur due to the fact that our market was practically pegged by the London market plus duty and freight. The London market during this period averaged less than three cents per pound.

Profound Changes in 1940

The course of world events during 1940 had a profound effect on the American zinc industry. The first days of the year found the industry moving rather sluggishly following a depressed market at the close of 1939. Prime western slab zinc opened at 5.75 cents f.o.b. East St. Louis, and this price soon slumped to 5.50 due to a lack of backlog of unfilled orders. Smelters were building stocks and curtailment of production was indicated.

However, the situation took a decided turn with the invasion of Belgium and Holland and the announcement of our extensive national defense program. May and June saw a decline in stocks as orders increased. By September 24 the price of prime western slab zinc was firmly established at 7.25 cents East St. Louis and export demands, particularly from Great Britain, were substantially increased because the output of European smelters in Axis-controlled countries was cut off.

The smelting capacity under the control of the Allies and their possessions at the beginning of 1940, excluding the Western Hemisphere, was approximately 823,000 tons, of which 607,000 tons were from retort smelters, and 216,000 tons from electrolytic. This smelting capacity includes the following countries: Belgium, France, Great Britain, Norway, Netherlands, Indo-China, Australia and Rhodesia. The Polish production had, in September, 1939, been taken over by Germany; therefore, this capacity is not included in the above figures.

A review of the smelting capacity that is now in the hands of the Allies shows that all of the above mentioned tonnage, excepting that of Great Brit-

ain, Indo-China, Rhodesia and Australia, totaling approximately 214,000 tons, is under the control of Germany. This means that a total of 609,000 tons of the productive capacity has been taken out of the world market, inasmuch as Germany cannot deliver tonnages to any of these countries which are not under her control. Of course, by the same token these same countries must look for their entire consuming needs within German dominated territory, and thus there will be no call from them on outside production capacity.

At the beginning of the year 1940, there was under the control of the Axis approximately 567,000 tons, of which 428,000 tons were classified as retort, and 139,000 tons as electrolytic; add to this the 609,000 tons that Germany has taken into her control, since the first of the year, makes a total producing capacity of 1,176,000 tons, and leaves the Allies only 214,000 tons.

The actual world production from these facilities, compared with capacity smelting facilities, at the end of 1939, was as follows:

Location	Smelting Capacity Tons	Actual Production Tons
North American Continent	982,000	775,000
Great Britain...	97,000	56,000
Australia	82,000	78,000
Rhodesia	29,000	14,000
French Indo-China.....	7,000	6,000
Japan	60,000	60,000
Russia	100,000	100,000
Axis-controlled..	1,176,000	760,000
Total 2,533,000		1,849,000

All of these figures except those from North America are taken from the American Bureau of Metal Statistics and converted into terms of short tons.

This tabulation shows the present world productive capacity (excluding the Axis group) to be 1,357,000 tons; and, during 1939 actual production from this group was 1,089,000 tons.

The end of 1940 found the zinc metal situation growing extremely tight. Accelerated domestic and increased foreign demand depleted smelter stocks on hand to an extremely low point.

Prices have remained stabilized at 7.25 cents East St. Louis since September in line with government policy.

Output for the Year

Despite the slow start during the early months of the year, the average monthly output from domestic ore in 1940 was 53,616 tons as compared with 44,850 tons in 1939, with the highest rate of production reached in December with 59,883 tons. The annual production report shows 643,386 tons or an increase of 19.54 percent over 1939 figures. Together with the slab zinc smelted in bond from foreign ores and shipped abroad, and from secondary sources, the total output in 1940 is estimated at 720,000 tons and represents an all time record high.

Drilling bench of the Glory Hole No. 2 mine, American Zinc Company of Tennessee

According to scheduled increases in smelting capacity, primary and secondary metal production from both foreign and domestic ores should make available approximately 75,000 tons of slab zinc per month by the end of the second quarter of 1941. This figure represents an increase of 25 percent over 1940, which should bring the supply and demand more nearly into balance.

Imports of slab zinc had increased in 1939 because of a reduction in the zinc tariff effective January 1, 1939, but 1940 saw these imports dwindle materially because of the war conditions prevailing in major zinc exporting countries. On the other hand, zinc ore imports increased from 36,100 tons in the 11-month period ending November, 1939 to 164,395 tons in the same period in 1940. Sources of slab zinc imports were mainly restricted to Mexico and Canada following the invasion of Belgium, Norway and Poland and the collapse of France, and the available imports from Mexico and Canada were reduced considerably by demand from other countries. Increased ore imports occurred because of accelerated demand in the United States and lack of formerly available smelting capacity in other countries. Some 55 percent of these are imports that came from Mexico, with Canada, Peru, Argentina and Newfoundland shipping the bulk of the remainder.

The American Zinc Institute's regular monthly record of shipments indicates that 683,674 tons of slab zinc entered domestic consumption in 1940, an increase of 14 percent above the 1939 figures of 598,972 tons. Unfilled orders at the end of the year mounted to 125,132 tons as compared to 36,808 tons on January 31, 1940. Slab zinc stocks at smelters were reduced from 65,995 tons on January 1, 1940, to 12,884 tons on December 31, 1940, approaching the record low of 11,227 tons on hand in August, 1937. From recent surveys by the Bureau of Mines, it appears that while consumers' stocks on hand are substantial, they are also on the decline.

Current Demand Taxes Capacity of Mines

The current demand for export zinc has been heavy. As sources of European supply were shut off, importing countries including the United Kingdom, France, the Near East, South America and the Far East turned to the United States as a source of supply. Exports to the United Kingdom represented over 45 percent of the total exports shipped in the 11-month period ending November 30. Total slab zinc exports in that period rose from 1,849 tons in 1939 to 75,349 tons in 1940. On January 11, 1941, the government proclaimed strict regulations on exports of zinc, as well as copper, brass, bronze and nickel, to become effective February 3, 1940.

Although tri-state ore production did not increase commensurately with the change in ore prices, the total for 1940 was 417,948 tons; that for 1939 was 402,417 tons. Net reserve concentrate stocks in the tri-state district remained less than a week's production through most of the year as, reflecting changes in metal prices, the Joplin ore market prices advanced from $37.50 per ton at the beginning of 1940 to $48 per ton in September, at which point it remained through the balance of the year.

The expansion of smelter facilities in 1941 is predicated on the continued flow of both domestic and foreign concentrates and, therefore, the continued availability of ocean shipping space is essential.

Under existing conditions foreign markets no longer exert an influence over American prices and this situation will probably prevail as long as the war continues. However, when peace comes, the large stocks of zinc in belligerent countries, plus the reduction of 20 percent in the American zinc tariff and the additional smelting facilities built for defense needs in the United States and in Canada, makes the post-war zinc picture far less rosy than present conditions indicate.

Notwithstanding this long-range outlook, the zinc industry will continue to cooperate to the fullest extent with the Defense Council and hopes to provide all the necessary requirements for Army and Navy needs.

Striking view of stope on 5-level No. 2 Mine

American Zinc Co. Mascot, Tenn.

MERCURY In 1940

By WORTHEN BRADLEY
President
Bradley Mining Company

Mercury is a strategic mineral. Can domestic production meet our needs? Mr. Bradley discusses this timely question.

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IN 1940 mercury received the attention of the criminal element, and when that happens to a commodity, it can be submitted that it has reached the status of big business. Thefts of mercury, complete with holdups of watchmen, occurred on both coasts: 14 flasks from the Oat Hill Mine in California, and 120 from F. W. Berk & Company in New Jersey. I believe that all the stolen metal was finally recovered.

Government Purchases Being Made for Stockpile

Mercury also received the attention of the United States Government and was designated a strategic mineral, one of a list of nine, at last count. Large purchases for the Government stockpile are now under way, and the Bureau of Mines and the Geological Survey are continuing to perform valuable work in the field.

The domestic mercury industry staged a remarkable upswing in production in 1940, and is still going

strong. In addition to supplying the domestic market, it produced a surplus for export. It has given glorious refutation to those who feared a domestic shortage due to early depletion of our mines.

Domestic Production Has Not Been Equal to Domestic Consumption

It is true that those who viewed with alarm could look at certain statistics for substantiation of their fears. From 1919 through 1939 we were able to produce only 55 percent of our apparent consumption. But it is also well established that a high price for the metal quickly results in a surplus over our own needs. During the war years 1916 through 1918, the price increased 128 percent and production 59 percent over the previous six-year period. Seven thousand flasks per year were exported.

The ratio of production increase is even more pronounced during the present period. The average price for 1940 was $177, up 127 percent from the 1934-1938 period (I am not including 1939 as it was a hybrid year, partially affected by the war). We have the 1940 production figures through November, and know the total for the year will be close to 36,000 flasks. A 1940 production of 36,000 flasks is up 114 percent from the 1934-1938 average.

Comparing the two war periods, it is encouraging to note that while the percentage of price increase is almost exactly the same, the present era's percentage of production increase is almost twice as great as that of the World War period. And our production, continued at its present rate, will exceed the 1916-1918 average (32,557 flasks) by several thousand flasks per year.

Imports through November, 1940, were only 171 flasks; all of these came in during the first four months, 147 of them in January. Imports of any consequence do not seem probable for 1941. Even if the United States follows Great Britain's lead in a trade rapprochement with Spain, it seems unlikely that any Almaden mercury will reach these shores; particularly if the price continues at its present level of $250 per flask f.o.b. Spain.

Exports Controlled

Our exports were placed under the control of a Government Administrator in July, 1940. As an example of how this control can be used, consider that while the Administrator delayed the granting of licenses for export to England, prices fell during July and August from $200 to $175, then rallied to over $180 as licenses began to be issued. Exports for 1940 totalled 9,049 flasks through November, and should run along at about the same rate in 1941. Australia and the East Indies have been added to the list of purchasers of U. S. mercury; no shipments have lately been made to Japan.

Will domestic production be sufficient if we enter the war? To answer this we can refer to past history. The figures show a 34 percent increase in apparent consumption during the World War period; applying this increase to the present period, we would need a yearly production of 36,207 flasks. As this is our present rate of production, it can be seen we have no particular cause for alarm; provided exports remain under Government control, as they no doubt will.

Greenan Mercury Mine, Humboldt County, Nev.

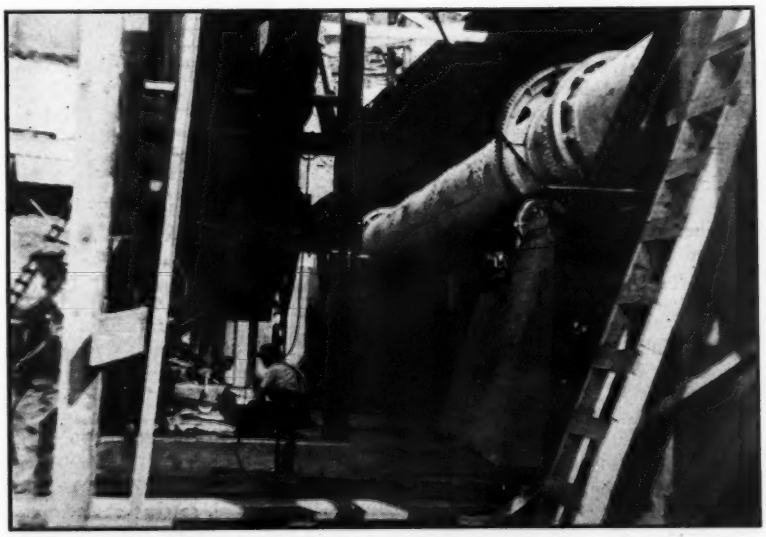
The largest single domestic use for mercury, at present, is a rapidly growing one. It is the manufacture of mercuric oxide for anti-fouling paint for ship bottoms. Uses of mercury are also increasing in the electrical industry. But there are declines which partially offset this trend; for instance, the substitution of lead azide for mercury fulminate in some of the detonator manufacturing.

Production Encouraged by Governmental Action

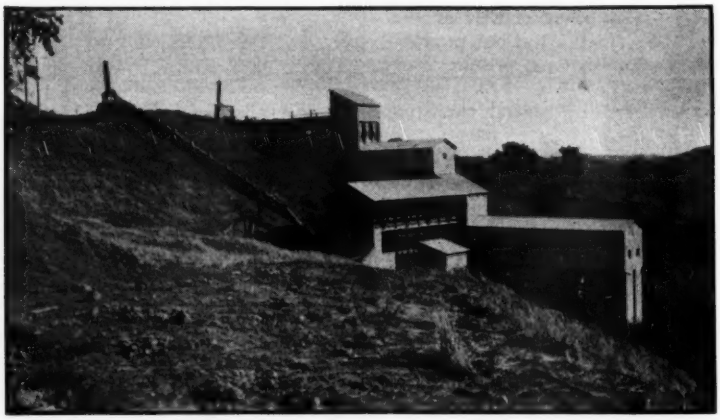
Domestic producers are grateful that mercury, as a strategic mineral, has had its produced income declared exempt from the excess profits tax. They are also grateful for good prices and limited imports, but could plan their development campaigns more intelligently if they had some idea how long this situation will continue. They know what it is to be left out on a limb; their memory is good.

Are Ore Reserves Adequate for Increased Production

How will domestic mines bear up under the increased rate of production? Again the answer is encouraging. The mines are producing 3,500 flasks per



Adding second rotary kiln, Bonanza Mine, Douglas County, Oreg.



New Almaden Mine, Santa Clara County, Calif.

month now, and will probably add to this figure during 1941. In California, the New Almaden and Knoxville mines are treating surface ore, and should increase production when underground ore reaches their plants. The old Abbott, Mt. Jackson, and Reed mines have new plants, and the New Idria continues as the largest producer in the state. In Oregon our country's largest producer, the Bonanza Mine, has increased its plant capacity to 200 tons per day with the addition of a second rotary kiln (its third furnace). The Horse Heaven is producing steadily. In Nevada the Midas district has become very active, and the 40-ton Herreschoff plant at the McAdoo Mine (in the Bottle Creek district) is in full operation. Developments are also proceeding in Idaho, Texas, Arkansas, Arizona, and even Alaska.

Thus far most of the increased production has come from new ore in old mines. The latest development of an important new mine on this continent occurred last year at Pinchi Lake in northern British Columbia. That discovery, plus other comparatively recent ones in the Weiser (Idaho) and the Arkansas fields, prove that pioneer prospecting days for mercury have not ended.

WAR'S EFFECT on TUNGSTEN

● ***War industry must have tungsten for high-speed cutting tools, as well as for other vital uses. Will we have enough?***

By CHARLES H. SEGERSTROM
President
Nevada-Massachusetts Company

SO many months have passed since the Second World War began and there has been such a disruption of world commerce and the various blockades and trade agreements have resulted in such restrictions of trade, that it is very difficult to present a view on American supplies of tungsten. Therefore, all we can do is to view it in the light of its effect upon our American consumption and production.

During this period there has been no acute shortage of supplies and prices have remained more stable and firm than in any equal period in the past 10 years. This has been due largely to the determination of the domestic producers that tungsten prices should not be raised beyond the prices prevailing in 1939.

Prices Have Risen

In the three quarter periods before the beginning of the war in September, 1939, the demand for tungsten had been slow and prices ranged from $16 to $20 for domestic ore delivered to Eastern consuming centers.

Immediately following the declaration of war by Great Britain and France the domestic demand increased rapidly. This resulted from domestic and foreign orders for tool steel. The domestic prices at the mines remained stable at around $22 per unit, and as the demand became more urgent, domestic prices rose to $23.50 toward the end of 1940 for spot material, the larger consumers having protected their future commitments at prices ranging from $22 to $22.50.

The prices of foreign ore have ranged from $16 to $18.50 C.I.F., which plus the duty of $7.93 makes the current market prices from $23.93 per unit to $26.43 per unit, or a price greatly in excess of those quoted by domestic producers.

It is estimated that the domestic consumption during 1940 was nearly double that of 1939, and that during 1940 nearly 12,000,000 pounds of W, or approximately 12,000 tons of average grade of concentrates were consumed. Of this amount the domestic production was slightly over 5,000 tons of ore or 5,000,000 pounds of W, the balance of the ore having been either imported or taken from stocks on hand, so that at the end of 1940 the stocks of ore on hand in the various plants and the stocks in

the hands of producers were practically nil.

As we face 1941 the situation has become acute and unless supplies are released by the War and Navy Departments from stockpiles on hand or from the ore purchased in China, there probably will be a shortage in the steel mills which are now making high speed tungsten steel. Arrangements are now being made looking forward toward such a relief to take care of the urgent needs for current consumption.

Domestic Sources of Supply Increasing

The domestic situation will be relieved materially during the coming spring and summer through two domestic developments which give promise of large additional sources of domestic ore.

The first is near Bishop, Calif., where the United States Vanadium Corporation, a subsidiary of the Union Carbide Corp., at its Pine Creek property is building a large plant with a mill capacity of 1,000 tons per day. When this development is completed it is estimated the monthly production will be 12,000 units of WO_3, and it is anticipated that this program will be completed during the summer of 1941.

The second development which is now practically completed, is that of the Nevada-Massachusetts Company at Mill City, Nev., and its joint undertaking with the Golconda Syndicate at Golconda, Nev. These two plants will be in operation in early spring. It is estimated that the Nevada-Massachusetts Company and its affiliates in Nevada will have a monthly production of over 15,000 units per month when the plants are in full operation.

The plant of the Nevada-Massachusetts Company and the Golconda Syndicate, at Golconda, Nev., is unique in that it will handle a complex ore by milling magnetic separation, sintering, and chemical treatment.

The tungsten in the ore will be reduced to a sodium tungstate which will then be refined and precipitated through the chemical plant, the ultimate product being an artificial calcium tungstate or scheelite. In addition to the complex manganese tungsten ore, the plant will treat the low-grade flotation concentrates from the Mill City tailings plant, together with any other low-grade material which may be developed and which does not carry sufficient WO_3 to be commercial ore.

In the late spring other new developments are expected in California, Nevada, Utah, Idaho, and Montana, and it is anticipated that the 1941 production might double the 1940 production of domestic scheelite. Some of the new properties have excellent showings and give great promise.

Foreign Purchases Made for Stockpile

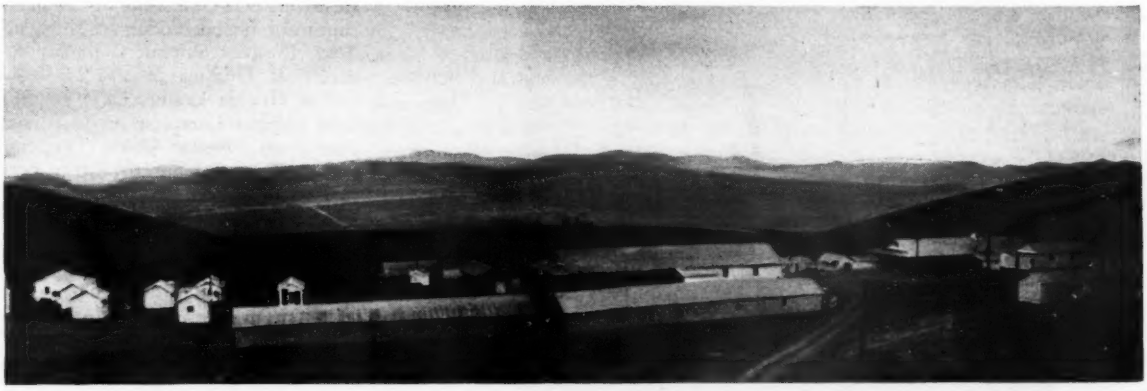
Since the new World War began, the Army and Navy have purchased for strategic stockpile both domestic and foreign ores and, in addition to this, large supplies have been purchased directly from China through the advance made by the Reconstruction Finance Corporation. Many shipments have already been received in the United States and, for the first time in history, the Army and Navy have strategic stockpiles of tungsten in considerable tonnage.

The domestic producers are in thorough accord that prices must be held down and production increased, so that the price of tungsten will not rise to the heights which it did in 1937. During that year prices rose as high as $35 per unit, caused entirely by the heavy buying of the Axis powers in anticipation of the conflict which came two years later. The situation at the present moment would be considerably eased if all those who have scrap high speed steel on hand would sell at current levels, as every pound of tungsten recovered as scrap would be as effective in alleviating the situation as is a pound from new ore.

The tungsten which was formerly shipped to the United States from China, and which was our principal foreign supply, came through Hong Kong. These shipments have now been diverted over the Burma Road through French Indo-China, whence they have been transshipped to the United States, and several cargoes are now afloat in addition to those which have been received.

The Ministry of Supply in London controls all shipments from Burma, and they have a fixed price which they pay the producer, which is about 60 shillings a long ton unit. This tungsten is then shipped direct to England. No records are available on current production except for the first quarter of 1940, when 3,000 long tons of Wolfram concentrates were shipped to England.

In the Japanese controlled portions of China very little tungsten seems to be produced—the Chinese have evidently gone on a strike. As far as we can ascertain very little tungsten has been delivered to the Japanese, as they are out in the world market trying to secure ore. In those tungsten districts, however, which still remain in the hands of the nationalist Chinese government, work is proceeding as fast as possible and they



Camp at the Mill City, Nev., tungsten mine of Nevada-Massachusetts Company, overlooking the broad Humboldt Valley

are making every endeavor to secure additional supplies. Current prices are very high for these Chinese operators, as the ore must be brought out over the long Burma Road. Special trucks are used which are given right of way over other traffic. A large quantity of ore has been shipped since the Burma Road was opened in the summer of 1940.

The Chinese mines are low grade and but for the human factor could not be operated even at present prices. The low cost of labor appears to be the main factor in profitable operation of their mines, and the latest information we have available is that the miners receive 80 cents per day in Hong Kong dollars, which is equal to about 20 cents per day in American wages. While machinery of various sorts seems to be more or less available, very little effort is being made to take advantage of power equipment.

Production Statistics in 1940

During the calendar year of 1940, no report has as yet been made by the Bureau of Mines, but it is estimated that approximately 5,000 short tons of concentrates containing 60 percent WO_3 or 4,000,000 pounds of W were produced and shipped from the mines in the United States. During the calendar year of 1939 the United States Bureau of Mines reported production of 4,287 short tons of concentrates containing 60 percent WO_3 (approximately 3,200,000 pounds of W) shipped from mines in the United States.

Due to the increased production which is expected soon from the two large developments and many hundreds of small mines it is my opinion that during 1941, if the price and demand continues firm, the domestic production will be double that of the production of 1940.

The United States Bureau of Mines and the Geological Survey are doing much of value, both in encouraging production and in doing actual development work and diamond drilling on many properties which, in their opinion, warrant such work; this should bring forth valuable additions to the known orebodies in America. There are many hundreds of prospects in the United States which are either too low grade or cannot be worked profitably for various reasons, which may form a valuable adjunct to our known deposits in time of National Emergency.

SULPHUR in 1940

By W. W. DUECKER
Texas Gulf Sulphur Company

Shipments for the year up 300,000 tons over 1939 but producers are maintaining adequate stocks for all purposes. Total stocks on hand at year end are estimated at 4,200,000 tons.

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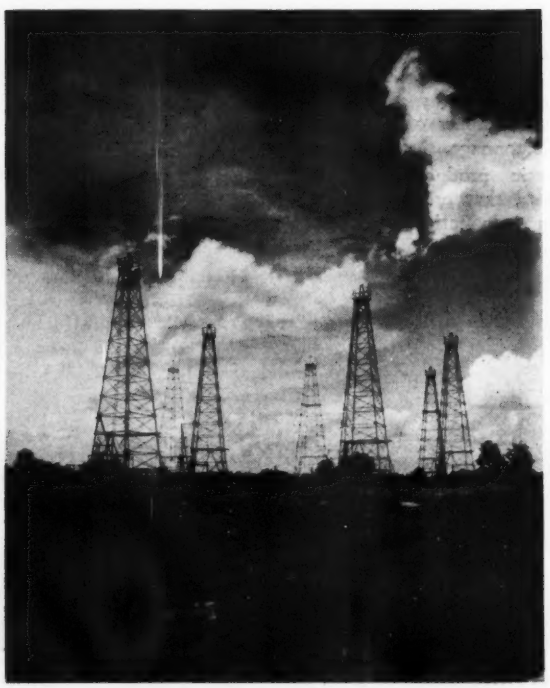


Sulphur wells at Newgulf, Tex.

MAJOR production of sulphur in the United States in 1940 was confined to the states of Texas and Louisiana, with but small tonnages produced in Colorado, Utah, and California. Texas Gulf Sulphur Company continued its operations at Newgulf, Tex. Freeport Sulphur Company operated at Hoskins Mound in Texas and at Grande Ecaille, La. Jefferson Lake Sulphur Company produced sulphur from Clemens Dome, Tex., and Duval, Tex., Sulphur Company continued to operate at Orchard Dome, Tex., but ceased operations on Boling Dome in the early part of the year.

Domestic Production

Total sulphur production amounted to about 2,725,000 gross tons, an increase of 23 percent over 1939. Shipments from the mines exceeded the

Sulphur from the wells discharging into a vat, Newgulf, Tex.

1939 figure by over 300,000 tons and reached a total of almost 2,600,000 tons. This constitutes a new record for the American industry, and represented an increase of about 4 percent over the previous high year of 1937. Domestic shipments of 1,800,000 tons were about equal to the record of 1937 and exceeded those of 1939 by approximately 12 percent. There was a slight increase in the stocks maintained by Texas Gulf Sulphur Company, bringing its total at the end of the year to nearly 3,000,000 tons. This quantity alone is sufficient to care for the domestic demand for about one and two-thirds years at the 1940 rate. Government statistics on stocks are not yet available, but it is estimated that other mines will add about 1,200,000 tons to this figure and that the total stocks of the sulphur industry are in the neighborhood of 4,200,000 tons. Using 1940 figures these stocks would be sufficient to meet all needs, domestic and foreign, for a period of over a year and a half.

Foreign Trade

The chief foreign consumers of American sulphur in 1940 were Great Britain, Canada, and Australia. Total foreign shipments during the year amounted to about 750,000 tons, an increase of 12 percent over the 1939 total. The foreign shipments reflect changes brought about by the war. Formerly, large quantities of sulphur were exported to Norway and Sweden but these markets have been completely closed and no American sulphur is going to any port in the Scandinavian Peninsula. A compensating factor, however, lies in the fact that the sulphite pulp heretofore imported from those countries is now being manufactured in the United States and Canada, and hence a portion at least of the increase in domestic consumption of sulphur and the shipments to Canada may be attributed to the decline in imports of foreign pulp.

In the past, Italy and Norway supplied large quantities of sulphur to Europe and the Eastern Hemisphere, but exports from those countries have been curtailed or stopped by the war. To a large extent American sulphur has replaced the tonnage latterly shipped by Italy to India and Australia. In general those other countries that had appreciable requirements for sulphur either produced it locally or depended upon pyrite. The export business of Japan was greatly diminished during the year, but there were signs of increased activity by Chilean producers, particularly on shipments into the Argentine. No great change is expected in the export field during the coming year, and actual shipments, naturally will depend both upon the world political situation and on the available supply of ships.

During the year there was no reported change in the quoted contract price of $16 per gross ton of crude sulphur f.o.b. cars mines. It may be reasonably expected that the coming year will show little if any variation in the price f.o.b. mines, notwithstanding the fact that the delivered cost to the consumer will vary with fluctuations in the cost of ocean freight.

Domestic Consumption

It is estimated that as in 1939, natural sulphur or brimstone was the source of over 70 percent of the total sulphur consumed in this country during the past year. The remainder of the market which was in the sulphuric acid industry was supplied by the sulphur dioxide produced from roasting iron pyrite and from smelting copper, lead and zinc ores. About 77 percent of all sulphur consumed in the United States is used in the form of sulphuric acid.

Major consumption of sulphuric acid in the United States was in the fertilizer, petroleum, steel and metallurgical, and chemical industries. Since all of these were very active in 1940, the consumption of sulphuric acid was stimulated. Several new sulphuric acid plants were in the process of construction or were actually put into operation. Likewise, a number of new sulphuric acid alkylation plants for the production of high octane gasoline were installed in the petroleum industry. The production of many other chemicals, in the manufacture of which sulphur or sulphuric acid is employed, was expanded. Certain factors, however, tended to offset

some of the increase in the consumption of brimstone. Some manufacturers of sulphuric acid are supplementing their sulphur requirements with increasing quantities of hydrogen sulphide recovered from petroleum gases. Substantial amounts of sulphur were recovered from manufactured gas and about 30,000 tons of sulphur, recovered from smelter gas in Canada were sold on the Pacific Coast. In general, however, increased business activity was mainly responsible for the increase in the domestic consumption of sulphur.

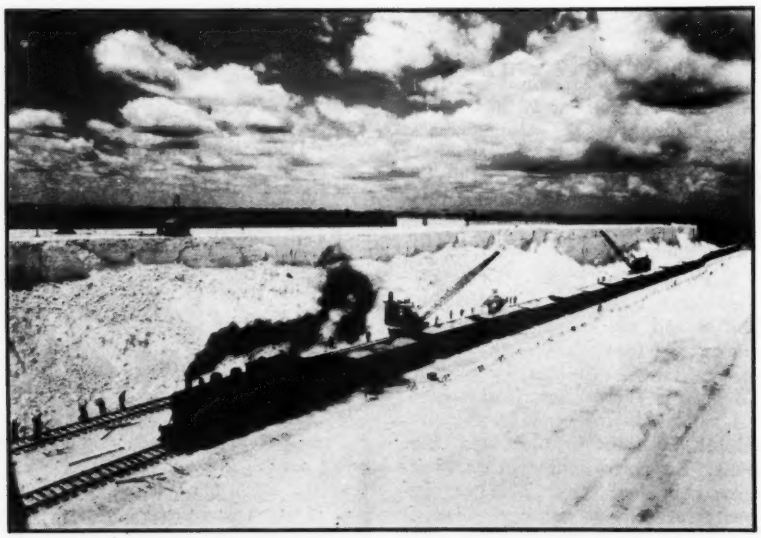
Increased Usage

As indicated above, another industry which has been stimulated by changed conditions brought about by the war and which usually requires over 15 percent of the brimstone shipped to domestic consumers is the pulp and paper industry. Efforts by domestic producers to make up deficiencies resulting from the cessation of imports from Europe have increased the consumption of sulphur over what would otherwise have been the requirements of the industry. Manufacturers of kraft pulp, who formerly consumed large supplies of foreign salt cake (sodium sulphate), obtained some of their production through the use of sulphur in their pulping operations. Research is being carried out to explore the economic possibilities of extending the use of sulphur in this industry.

During the year, several announcements regarding sulphur were made to the technical world which were perhaps more of academic interest than of economic importance to the industry. A new method was perfected for making heavy sulphur thus furnishing scientists a new material for studying problems of health and disease. It was reported that sulphur chloride could be used to disperse fogs over airplane landing fields. A new synthetic fiber, containing sulphur and said to resemble wool, was patented. In Great Britain strontium sulphide has been in demand for luminous paints. Vitamin B, a sulphur-containing vitamin, was reported to be of great value to horticulturists in promoting vigorous growth in flowers and trees.

Sulphur and Defense

Although sulphur and sulphuric acid are important to industry in general and therefore have vital parts to play in this nation's defense program, the parts they play in munitions, are of a minor nature. This is contrary to the opinion of many who have in mind the experiences of 1917 and 1918. During the last war large quantities of sulphuric acid were required to produce the nitric acid used in making high explosives. This process has been almost entirely supplanted since nitric acid, today, is made by oxidizing ammonia, which in turn is produced by fixation of atmospheric nitrogen. The use of sulphuric acid in the manufacture of high explosives is therefore practically limited to the role of a dehydrating agent. Consequently, it may be anticipated that the production and consumption of sulphur will be more closely related to the consumption of acid by rayon, cellulose, chemical, paint and pigment, petroleum, fertilizer and the iron and steel industries than by the munitions industry. The great change which has thus taken place as a result of a different chemical technology can best be appreciated by comparison with the history of sulphur and sulphuric acid in the last war.



Loading a train from a vast stockpile of sulphur

Changes Since 1918

In the five-year period, 1914-1918, approximately 7,600,000 tons of sulphur in all forms were consumed by American industry, and of this quantity 43 percent or 3,300,000 tons, were elemental sulphur. In 1918, out of a total of 1,400,000 tons of sulphur in all forms used in the production of sulphuric acid, it is estimated that 500,000 tons, or 36 percent was actually consumed in the manufacture of explosives. According to government reports, 2,200 pounds of 100 percent sulphuric acid (requiring about 750 pounds of sulphur) were consumed at that time in the production of 1,000 pounds of T. N. T. Today, as a result of newer processes, it is estimated that approximately 30 pounds of sulphur are required for the production of the same quantity of T. N. T. It is improbable, therefore, that sulphur in military explosives will constitute any great portion of industry's requirements.

Because of this, it is reasonable to expect that during the year 1941 the trend of domestic consumption will roughly parallel that of general business. Sulphur stocks at the mines and current producing rates are sufficient to supply any anticipated increase in demands in the immediate future and the potential producing capacity of the industry gives ample assurance that there will be no shortage of sulphur in the more distant future.

Company Hunts for Technical Men

Announcement has been made that Westinghouse Electric & Manufacturing Company, cooperating with the nation's leading colleges and universities, will proceed as usual with its annual hunt for young engineering talent, despite the fact that many graduates selected may be called for military training in the coming months.

Starting his annual four months' tour of 121 schools throughout the country, J. H. Belknap, manager of technical employment and training, will consider all college seniors interested in service with the company regardless of their draft numbers or of commissions they may hold in the Army and Navy.

SILVER Review for the Year, 1940

By WALTER E. TRENT
Washington, D. C.

Domestic silver production increased more than 3¾ million ounces in 1940 over 1939 but is still 3 million ounces less than in 1915, the record year. World production declined. Silver coinage increased; silver dollars in circulation amounted to $50,078,475, and the silver coinage in circulation became $3.49 per capita. Silver certificates held by the Federal Reserve Banks and agencies rose from $89,478,752 at the end of 1933 to $203,489,872 at the end of 1940. British India has reduced fineness of silver coins and will issue paper rupee notes. Britain also may issue fractional paper notes.

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THE silver production of the United States for the calendar year, 1940, was 71,688,150 ounces, valued at $50,977,440 (71.11 cents per ounce). This 1940 production value of silver establishes a new record under the Silver Act of 1934. The total ounces were less than those produced in 1915, which still remains the banner production year. The following table gives production and bullion values of the three leading years:

	Ounces	Value
1940	71,888,150	$50,977,440
1939	65,119,513	44,202,279
1915	74,961,075	37,397,300

The United States silver production by weight in 1940 showed an increase of 10.4 percent over 1939, which was a smaller increase than those of copper, lead, zinc, and steel ingots. Copper increased in 1940, 22.4 percent over 1939; lead, 27.4 percent; zinc, 25 percent; and steel ingots, 26 percent.

The present bullion price of silver is too low to sustain production increases from marginal ores relatively low in copper, lead, and zinc, but relatively high in silver. Defense preparations will require an additional 25 percent increase in copper, lead, and zinc production. This increase in production will be difficult to attain unless either the price of silver is raised or the prices of copper, lead, and zinc rise to higher levels.

Silver coinage in the United States increased from $27,913,498 in 1939 to $50,175,850 in 1940, an increase of 82 percent. The coinage consisted exclusively of subsidiary coins (50-cent, 25-cent, and 10-cent pieces), at the coinage rate of $1.38 per ounce. The 1940 coinage consumed silver bullion equals to 50.5 percent of the total domestic production.

Silver in Circulation

For the period 1933-1940, the United States mints have coined $175,470,200 of silver, of which $7,074,557 (coined in 1934-1935) represented dollar pieces at $1.29 per ounce.

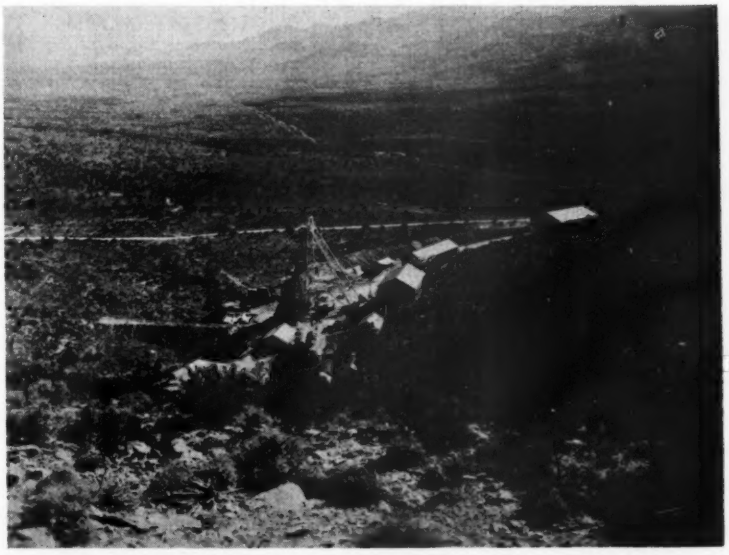
At the end of 1933 there were 29,337,523 silver dollars in circulation (33 cents per person). At the end of 1940, the silver dollars in circulation had increased to $50,078,475 (38 cents per person). The subsidiary silver coinage in circulation at the end of 1933 was $271,645,516 ($2.15 per person). At the end of 1940 subsidiary coinage in circulation was $412,225,692 (3.11 per person), making a total circulation of $3.49 per person.

During 1940 the increase of silver certificates was $93,457,214. The increase for the period, 1933-1940, was $1,378,566,180. The total silver certificate circulation at the end of 1940 was $1,677,359,837 (12.60 per person), which was 90 percent of the total silver certificates outstanding, $1,870,849,709.

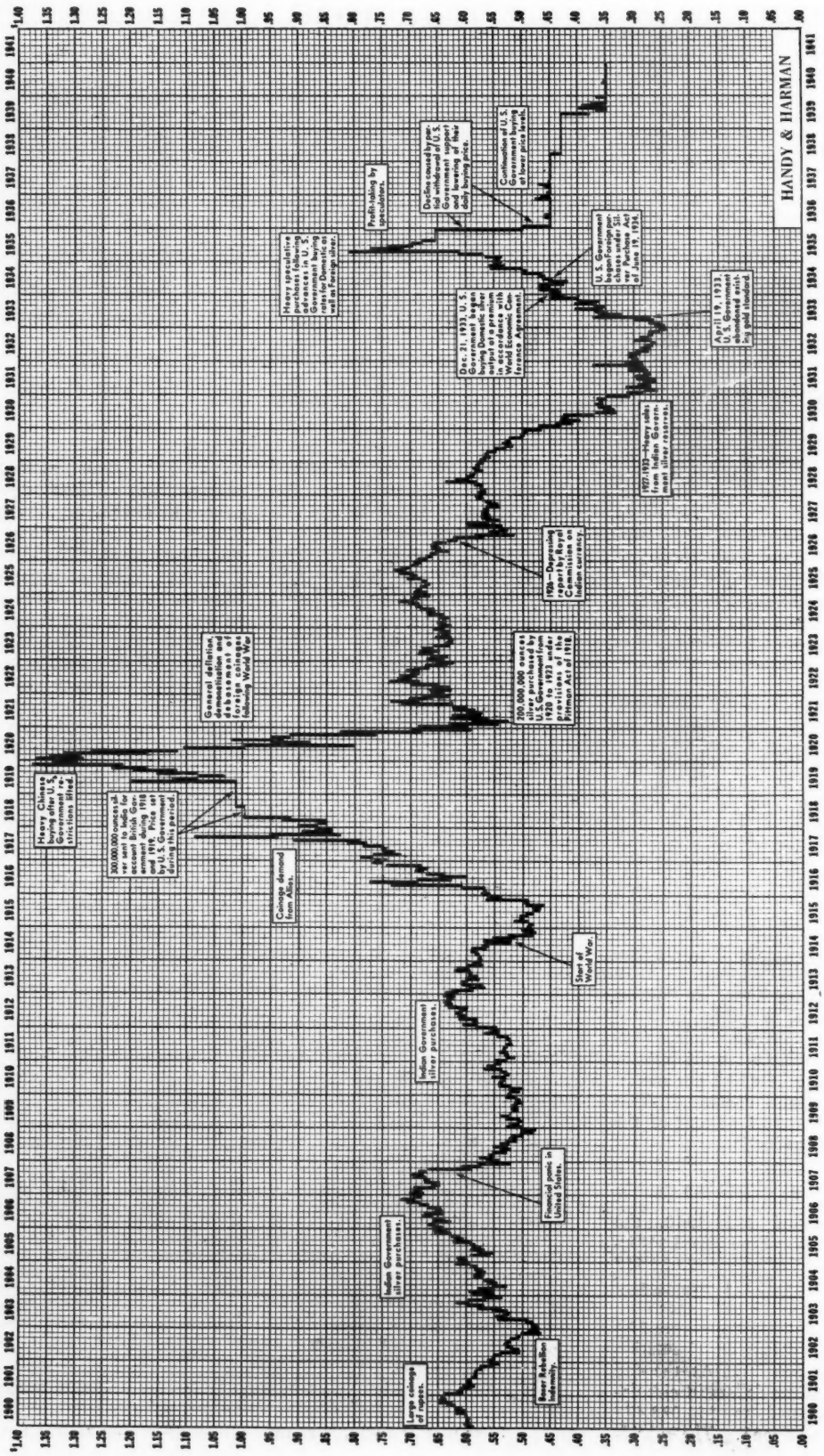
At the end of 1933, the Federal Reserve Banks and agents held $89,487,752 silver certificates. At the end of 1940, the banks and agents held $203,489,872, a net increase of only $114 million during the life of the Silver Act of 1934. These certificates constituted only .8 of 1 percent of the total Federal Bank Reserves, which, on December 31, 1940, were $14,062 billion.

Exports and Imports

Silver exported from the United States during 1940 was valued at $3,674,000. The silver imported into the United States for the calendar year, 1940, amounted to $58,434,000, the principal contributors being:



Silver mine at Pioche, Nev., supplied with power from Boulder Dam



Price of silver since 1900. Chart by Handy and Harman, New York

Mexico	$25,811,000
Japan	10,308,000
Canada	6,256,000
Peru	6,322,000

The 1940 United States production of gold was 5,914,171 ounces ($196,392,000). The estimated silver production of the world for 1940, based on nine months reported production will be 252,650,000 ounces in contrast to the 1939 production of 258,918,000 ounces. The 1940 production will be the lowest since 1935. The United States ratio of silver production to gold in 1940 was 12.1 to 1; in 1939, 11.6 to 1; in 1938, 12.3 to 1; in 1937, 15.0 to 1; and in 1936, 14.7 to 1. The ratio of world production of silver to gold for eight years has averaged 7.1 ounces of silver to 1 ounce of gold with only slight yearly variations.

There are restrictions against moving silver in and out of Great Britain and all British Empire countries. British India is continuing to maintain an import duty on silver of 6¼ cents per ounce against all countries outside of the British Empire.

The United States Treasury price for foreign silver (999 fine) is 35 cents per ounce, whereas the price in London (925 fine), is 23½ pence per ounce, which is the equivalent to 50 cents per ounce with the dollar and sterling at par; with sterling at $4.03, the London price is equivalent to the New York price of 41.4 cents per ounce. The Treasury Department through its stabilization operations permits England to maintain this differential for some reason which is difficult to understand. The British India treasury maintains a policy of selling silver at the London market whenever the price reaches 23½ pence, which it has done many times during 1940.

The British India treasury has been seriously depleted and is threatened with exhaustion, but plans have been perfected to issue paper rupee units and reduce the silver content of rupees from 925 to 500 fine. They have already clipped 4-anna silver subsidiary coin to 500 fine. Britain is also prepared to augment silver coin shortage with fractional paper; the notes are already printed and ready to issue. Soon Britain and India may develop internal monetary disturbances, which will cause them to appeal to the United States for emergency stocks of silver. The mints of the United States are now running at their maximum capacity in the production of silver coins.

The Federal Reserve System, in their January special report to Congress, recommended that the power be removed to monetize foreign silver and also the power to coin the present stock of seigniorage silver. The seigniorage silver in the Treasury now has a monetary value of approximately $1.8 billion, which many authorities believe has, in effect, been collected as an excess tax from American exporters of commodities and merchandise. The effect of the Federal Reserve recommendations, if fulfilled, would permit the Government to buy foreign silver, but at the expense of increased public debt. Such silver would be sterilized as to monetary use, but would be available to sell as bullion to industry and the arts in competition with American produced silver when the foreign and domestic price become equalized. This equalization of price under such circumstances would be along the lower level of the world price rather than the higher level prevailing in the United States.

Senator Townsend, in his farewell address to the Senate gave notice to the effect that the Federal Reserve System had omitted to make recommendations dealing with domestic produced silver, unmindful of his recent assurances when pleading for his Townsend Bill that he had every intention of protecting internal silver. Chairman Eccles testified before the Senate Special Silver Committee that internal silver, after a brief period of research, should be made dependent upon industrial consumption; that its further use as money should be discontinued. Under such circumstances, the United States then virtually would have a completely moneyless monetary system.

Effect of the INTERNATIONAL SITUATION on WORLD TRADE in Minerals*

By JOSEPH S. McGRATH
Chief Economist
Foreign Minerals Division
Bureau of Mines

The movement of minerals in world trade is now governed almost entirely by conditions imposed by war. In the past year our own defense program has profoundly influenced the flow of minerals to and from the United States. This article by Mr. McGrath is a particularly timely and interesting review of the present situation.

PRODUCTION and trade statistics, published monthly and annually by most countries, serve as the only yardstick for measuring the volume and direction of international trade in mineral commodities. The degree of dependence of consumer nations on foreign sources of supply may be gauged, within reasonable limits, from such data. In peacetime the interchange of this sort of information is a boon to international commercial relations; but in times of stress these details, for obvious reasons, become of vital significance, and suspension in the publication of such material is almost automatic when hostilities begin.

Since September, 1939, the belligerent countries and "occupied" nations and before that date China and Japan suspended "for the duration" publication of mineral production and foreign trade statistics; countries that do release some material publish it in such form as to make the data useless for analytical purposes. However, in the absence of adequate information relating to international flow of mineral raw materials during 1940 that would permit the preparation of a comprehensive annual review, there were developments during the year

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that are closely linked to the international situation generally, and reference to them may justify use of this space in the Annual Review number of THE MINING CONGRESS JOURNAL.

Mineral Import Trade of United States Stimulated Under Pressure of National Defense

The position of the United States with respect to its dependence on foreign sources of supply for certain strategic and critical minerals, as listed and defined by the Army and Navy Munitions Board in March 1940, was strengthened considerably during the past year through effective administration of the Strategic Materials Act (Public 117—76th Congress), which became law in June 1939. Certain restrictions or limitations of this act had retarded its stock-piling provisions to such a degree that in June 1940, the Metals Reserve Co. was created, as a subsidiary of the Reconstruction Finance Corporation, to expedite purchases of selected materials, such as tin and manganese.

The rapidly changing conditions in world markets since last May, and developments in our national defense program, have prompted negotiations between the United States Government and foreign producers of certain minerals essential in the present emergency.

In September 1940, the Metals Reserve Co. agreed to purchase from the National Resources Commission of China, tungsten ore whose value will total $30,000,000; the ore will be delivered over a period of years at prices established by existing market conditions at the time of delivery.

On November 4, 1940, a contract was signed by the Metals Reserve Co. and important tin ore producers of Bolivia, providing for annual delivery to the United States during the next 5 years of tin concentrates sufficient to produce 18,000 tons of refined metallic tin a year; the Bolivian Government guarantees performance of the contract. As there has been no tin smelter in the United States since 1925, the Reconstruction Finance Corporation has arranged for construction of a plant to process the imported concentrates.

Although the chief concern of the United States Government purchasing agencies is the procurement of strategic materials in which this country is deficient, nevertheless in December 1940, the Metals Reserve Co. announced that it had contracted to purchase 100,000 tons of Latin American copper. This contract involves four American corporations that operate properties in Latin America. Again on January 11, 1941, the Metals Reserve Co. contracted to buy 300,000 short tons of sodium nitrate from Chile.

Control of Exports Must Complement Procurement Program

As our program of national defense expands, it becomes increasingly clear that to insure domestic industries against serious shortages of vital raw materials, some method of export control must be applied whenever a deficiency can be anticipated. The need for such control was foreseen, and on July 2, 1940, H. R. 9850 "An Act to Expedite the Strengthening of the National Defense" became law. This act provides legal authority for the control of exports from the United States of munitions, materials, and machinery essential to our national defense.

Although control of exports is principally a matter of national defense and as such is a function of the Administrator of Export Control, War Department, the Department of State actually issues the licenses under which all controlled items are released for export. Seven Presidential proclamations and two Executive orders were issued between July 2, 1940, and January 10, 1941, specifying items, the export of which is now controlled. The list of controlled mineral products, including ore, metals, nonmetallic minerals, fuels, chemicals, semifabricates, and manufacturers, is too lengthy to enumerate here, but with reference to essential minerals it is now virtually all-inclusive. The text of these proclamations and Executive orders has been published by The National Archives in the *Federal Register* under Presidential Proclamations Nos. 2413, 2417, 2423, 2428, 2441, 2449, 2453, and Executive Orders Nos. 8607 and 8617. Copies may be obtained on request from the Division of Export Control, Department of State, Washington, D. C.

Latin American Sources of Strategic Minerals

Should dislocations in ocean traffic be extended, transport difficulties confronting our procurement agencies incident to the shipment of essential raw materials, such as Turkish and Greek chromite and Russian manganese may reduce or entirely cut off such supplies as Chinese tungsten, Malayan and Netherlands Indian tin, and Indian mica. These present and potential difficulties have prompted the United States to focus attention on sources of such essentials in the Western Hemisphere.

Closer collaboration between the United States and Latin America so far as the term affects the mineral industries is predicated on recognition of certain inherent problems whose permanent solution is not by any means a simple matter. Latin America is not industrialized as we understand the term. Consequently, practically all of the minerals, including petroleum, produced in the several countries are exported, heretofore principally to Europe. In several instances the economic well-being of the country depends on its export trade in minerals. Consider Chile, for example. In 1938 mineral products exported represented 79.4 percent of the total exports in value, while agricultural and related products comprised 17 and manufactures for 3.6 percent; copper constituted 57.4 and nitrates 22.4 percent of the value of all mineral products exported. In the same year the value of Bolivia's mineral exports (chiefly tin, tungsten, antimony, and precious metals) was over 96 percent of the total value of all exports. In 1938 the exportation of crude petroleum from Venezuela represented 90 percent of the total value of all exports from that country. Twenty-six percent of Colombia's export trade in 1938 was in crude petroleum; and 60.1 percent of Peru's export trade was in mineral products, chiefly petroleum (33.9 percent), copper (16.9 percent), bismuth, gold, and other mineral concentrates (8.1 percent). To a minor degree the remainder of the mineral-producing countries of Latin America are similarly situated; that is, their principal source of revenue is in the sale abroad of minerals of which the United States normally also has exportable surpluses. No real answer to this problem has been worked out as yet, but it is receiving serious attention by the United States and all of Latin America.

Opportunities that should prove to be of more immediate and mutual benefit to the United States and the countries of Latin America involved do exist, however, in the field of strategic minerals.

In 1940 (11 months) the United States imported 1,180,768 metric tons of ferro-grade manganese ore, of which approximately 30 percent originated in Latin America, chiefly Brazil and Cuba. Domestic production last year was about 6 percent of apparent consumption in the United States. With improved rail facilities in Brazil, and assuming ocean shipping space may be

available, it is reliably reported that about half of the United States requirements for 1941 may be obtained from Brazil alone. Cuba, and possibly Chile, may be able to reduce further this country's dependence on other foreign sources of supply.

Last year the United States imported 2,138 metric tons of tungsten, of which about 35 percent originated in Latin America. In 1940 the United States produced about 65 percent of our apparent consumption of tungsten, and under the impetus of prevailing demand this figure may be increased. However, if the United States could absorb the entire output of Bolivia and Argentina, it is believed that no deficit would develop in 1941.

In 1940 about 96 percent of the antimony imported into the United States originated in Latin America; 90 percent was furnished by Mexico and Bolivia, and the remainder by Peru and Argentina. The high rate of imports in 1940 indicates that some reserve stocks were accumulated.

The only Latin American source that contributed to imports of chromite by the United States in 1940 was Cuba, which supplied about 11 percent of total imports. However, Brazil has the largest deposits of chromite in South America, and although output is limited to only a few thousand tons a year, it is believed that with mine development, improved transport facilities, and favorable prices an annual production of 100,000 tons can be obtained.

Until a smelter is erected in the United States, tin concentrates available in Bolivia and Argentina cannot materially reduce dependence of the United States on Far Eastern sources of supply; even with smelting facilities available in this country, dependence could be reduced only to a limited extent. However, the output of ore in both Bolivia and Argentina can be increased and if the entire production becomes available to the United States the condition of this country will be less vulnerable than at present.

Electrical grade mica, quartz crystals, and industrial diamonds of Brazilian origin are likewise strategic materials available.

United States Supplies Technical Aid to Latin America

In addition to the commercial transactions negotiated during 1940, and others that may be consummated in the future that involve the purchase by the United States of mineral raw materials from Latin America, this Government, through the United States Department of the Interior, paved the way toward closer cooperation in the technical field. With funds appropriated by Congress late in 1940 the United States Department of the Interior was enabled to assign technical advisers to American embassies in certain countries of Latin America. These mining specialists may be instrumental in assisting the national defense agencies of this country whose chief concern is with procurement. The specialists will procure essential and current data relating to strategic mineral problems of a diversified character.

SECONDARY METALS in 1940*

By T. H. MILLER
Supervising Engineer,
Secondary Metals Section,
Bureau of Mines

Prices held down despite tremendous increase in demand.

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THE secondary-metals industry, in general, followed basic trends in primary metals rather closely during 1940. Price ranges and volume of deliveries were within normal limits, which is remarkable in view of the almost overwhelming demands placed on the industry especially during the latter half of the year. Business was quiet during the first part of 1940, with declining prices the general rule; but with the rapidly increasing requirements of the national defense program after the invasion of the Low Countries and the capitulation of France, the demand for metal, both primary and secondary, reached unprecedented proportions during the summer and fall. Copper, zinc, aluminum, iron and steel scrap, and other metals were in greater demand than the suppliers could produce. Proration of supplies was commonly practiced, and although prices of both primary and secondary metals rose considerably, unusual restraint in pricing was evident. As the necessity for export restrictions to conserve domestic supplies of many metals became evident, a series of Executive proclamations licensing their export was issued. Typical was the export-license requirement placed on all iron and steel scrap, which resulted in virtual exclusion of shipments to all nations except Great Britain and countries in the Western Hemisphere. The program was broadened considerably early in January 1941, when export limitations were extended to certain additional nonferrous metals.

Of interest during 1940 was the new series of production statistics for secondary nonferrous metals announced by the Bureau of Mines. Not only has the Bureau's annual canvass been enlarged to cover a larger segment of the industry, but detailed data on stocks of and recovery from various types of scrap as well as a break-down of metal obtained from new and old scrap are now available. The usual delays and difficulties were experienced in this initial survey, but better performance is anticipated in 1941. It is believed that these expanded statistical reports will prove to be of considerably greater value to the metal trade.

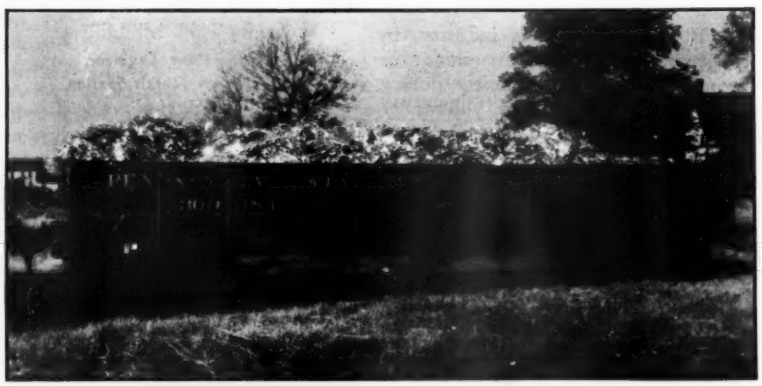
Iron and Steel Scrap

The output of iron and steel scrap reached the highest level in the history of the industry during 1940. Final figures are not available, but estimates

* Published by permission of the Director, Bureau of Mines, United States Department of the Interior.

Pouring molten scrap silver into molds

place the 1940 output at about 41,000,000 gross tons compared with 32,434,407 tons in 1939 and 38,060,000 in 1937, the previous peak year. The price of No. 1 Heavy-melting scrap at Pittsburgh was $18.25 a ton on January 1, fell gradually to $16.00 in April, as steel operations declined to 60 percent of capacity, then gained to $23.25 in December, the high point of the year. The average for 1940 was $19.035 compared with $17.06 for 1939. Exports during the first half of 1940 followed the pattern of 1939, but there were marked decreases in November and December as the export license proclamations went into effect. In July No. 1 Heavy-melting scrap was added to the list of materials requiring export licenses. Effective October 16, licensing was extended to include "all iron and steel scrap of every kind and description, classified or unclassified," and licenses were limited to shipments to the Western Hemisphere and Great Britain. Exports in November were 73,809 tons compared with 258,482 tons in October; of the November total 69,680 tons went to Canada and Great Britain. Exports for the first 11 months of 1940 were 2,725,583 tons compared with 3,347,241 tons during the first 11 months of 1939. Quarterly surveys of consumption and stocks of iron and steel scrap initiated by the Bureau of Mines in 1939 were continued during 1940. These surveys indicated a moderate drop in domestic stocks of iron and steel scrap at consumers' and suppliers' plants and in transit from 7,302,000 tons on December 31, 1939, to 6,669,000 on March 31, 1940, and a subsequent gain to 6,750,000 tons on June 30 and 6,993,000 on September 30. Stocks at the end of December, 1940, are not yet available.



Tin plate scrap en route to reduction works

Copper and Brass

The New York price of electrolytic copper for domestic delivery was 12.275 cents a pound at the beginning of the year which was the year's high. It declined to a low of 10.379 cents late in July, and subsequently rose to 11.785 cents at the end of the year. Export prices were slightly higher until the latter part of June, but for the remainder of the year export demand decreased greatly and export prices remained well below domestic quotations. Stocks of refined copper gained during the first half of the year but dropped rapidly during the fall and closed the year at the lowest level since 1928. Price movements of primary copper had a narrow range in view of the abnormal conditions prevailing the latter part of the year. Prices of scrap copper were closely geared to domestic quotations for primary metal, the price of No. 1 copper scrap having been roughly 1¼ cents below the primary price all year. No. 1 composition scrap declined to 7.75 cents in February and recovered to a high of 10 cents in November. Automobile radiator prices followed the No. 1 copper-scrap curve very closely, but from 3 to 3.5 cents lower.

Rising prices during the last quarter of 1940 failed to bring out an increased volume of copper scrap. Intake at custom smelters was 9,811 tons less than that during the same period of 1939; total for 1940 was 98,379 tons compared with 102,257 tons in 1939. The supply of brass scrap also appears to have been limited, as ingot manufacturers reported marked increases in unfilled orders. Premiums above market quotations were common during the last part of the year, and it was reported that an increasing volume of selected brass scrap was being returned directly to brass rolling mills. Brass plants were operating at near capacity during much of 1940,

Compressed copper scrap being charged into an anode furnace

indicating an increased volume of new or plant scrap. Much of this material, however, is returned directly to the rolling mills, thus by-passing the remelters and refiners.

Final data giving production of copper from secondary sources are not available, but it is expected that the output will be about the same as in 1939, when 499,700 short tons were produced. Production of secondary copper at primary copper smelters was 116,000 tons in 1940 compared with 116,613 tons in 1939.

Zinc

The St. Louis price of prime Western zinc declined from 5.8 cents a pound early in January to a low of 5.5 cents in February, then rose to 6.25 cents in June. In October quotations were stabilized at 7.25 cents for the rest of the year. Quotations for old zinc scrap fluctuated with the price of new metal, declining to 3.375 in February and rising to 6.25 in December. Quotations for new zinc clippings were nominal during most of the year and in December were quoted at 7.25 cents, the equivalent of new slab zinc, as shortages of primary metal developed. Premiums on clean zinc scrap were common during the latter part of 1940. The demand for primary slab zinc exceeded production, and stocks of new zinc at both producers' and consumers' plants decreased markedly. The shortage of new zinc for prompt delivery greatly strengthened the market for scrap zinc; but despite the abnormal demand, the output of redistilled secondary zinc declined from 50,428 tons in 1939 to 47,800 tons in 1940.

Aluminum

Primary aluminum was reduced from 20 cents a pound at the beginning of 1940 to 19 cents in March, 18 cents in August, and finally to 17 cents in November, a reduction of 3 cents a pound during the year. Prices of scrap aluminum, however, experienced only moderate changes. Quotations for aluminum crank-cases actually showed a net gain for the year from 10.5 cents at the beginning to 11.75 cents at the close. Old aluminum sheet opened at 15.75 cents and closed at 14.50, a loss of 1.25 cents. Demand for aluminum scrap was good, especially during the last 5 months of the year, as fabricators' requirements, both military and civilian, were higher.

POTASH and PHOSPHATES

POTASH

By CHARLES E. HEINRICHS
Research Chief
International Agricultural Corp.

THE year 1940 saw practically all of Europe at war again. However, in contrast with the situation soon after the outbreak of hostilities of the first World War the American consumers of potash are this time secure in the knowledge that a new industry is ready to meet their needs.

Present Position Improved Over That During Last World War

In 1915 the potash industry of this country produced 4,374 short tons of low-grade potash salts that sold for an average of about $78 per ton f.o.b. plant. By 1916 reserve stocks were exhausted and imports were blocked off with the result that average prices at plant rose to around $120 per ton. From then on until the end of the war and until imports began to flow into the country again, potash in any form was difficult to obtain and at one time during the shortage muriate sold for as high as $500 per ton on the coast.

By 1939 American production had been stepped up to 634,000 tons of salts on which the producers realized an average of just under $19 per ton at their plants. This production was largely from the plants of three major companies whose output has been increased during 1940 in the attempt to meet the situation created by shrinkage of imports from abroad. Also, a fourth major company, The Union

The growth of potash mining is illustrated by this view of a large modern plant

Potash and Chemical Company, has completed its mine and plant development during the year and has been in production on a large and increasing scale since October of 1940. Its output during 1941 will increase the total production of the country by about 75,000 tons of K_2O. It is significant that this new producer is making sulphate direct from its ore. This is the first production of its kind in this country and is of especial interest since the major part of the potassium sulphate consumed in the United States has previously been imported from European sources.

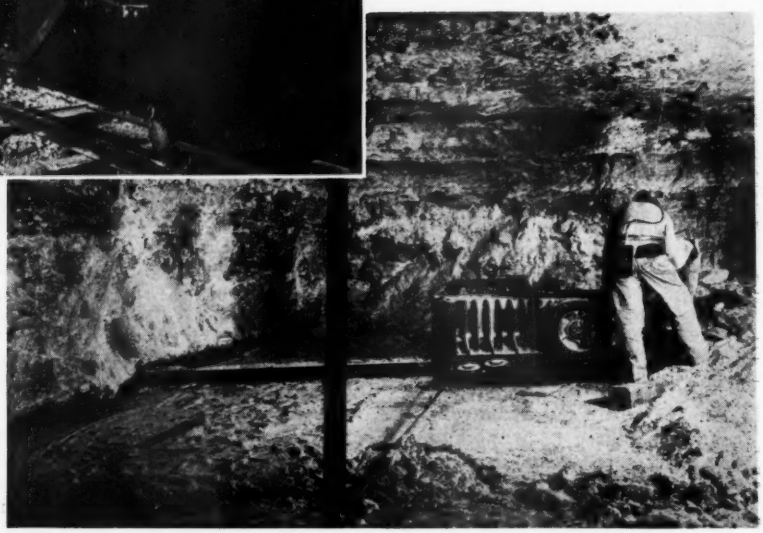
Many Production Methods

The widest possible range of production methods is represented in present American production of potash. Aside from by-product production in the cement, beet sugar, and distillery industries where both electrical precipitation of dust and extraction methods from plant wastes are employed, the primary producers have varied methods to best suit their particular conditions. For example, the American Potash and Chemical Corporation utilizes brines from Searles Lake, Calif., as its source. By means of vacuum evaporation and subsequent controlled crystallization, not only potash salts but other valuable commercial salts are extracted. Bonneville, Ltd., treating brine from Salduro Marsh in Utah, makes use of solar evaporation to produce a mixture of dry crystalline solids from which the potash salts are separated by ore dressing methods.

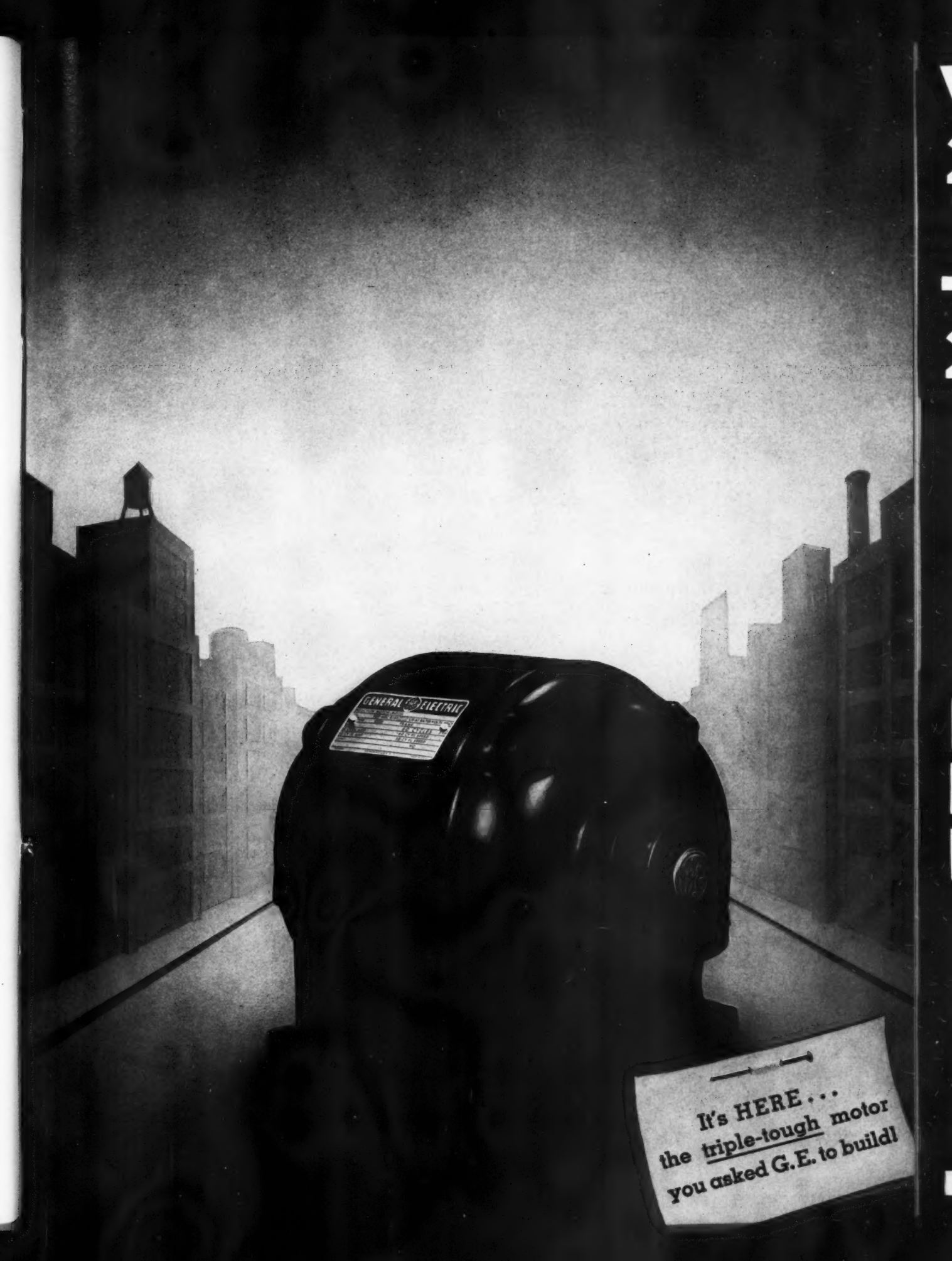
Plants in New Mexico

In the New Mexico field all three producing companies mine potash-bearing ores in underground mining operations at depths up to about 1,000 ft. In all cases the ore is treated in surface plants but in each case by different methods. The United States Potash Company produces its finished salts by first taking the ore into solution and later separating the desired products by fractional crystallization. The Potash Company of America, according to best information, makes use of both ore-dressing and solution recrystallization methods. The Union Potash and Chemical Company, being the newcomer in the field, has made use of new processes throughout. An important part of their production is purely by improved ore-dressing procedures and still another important part, namely, the sulphate, is produced by simple chemical reaction between two natural potash ores. A purely incidental but nevertheless highly interesting by-product of this sulphate production is magnesium chloride which is a raw material for the production of metallic magnesium.

(*Continued on page* 51)



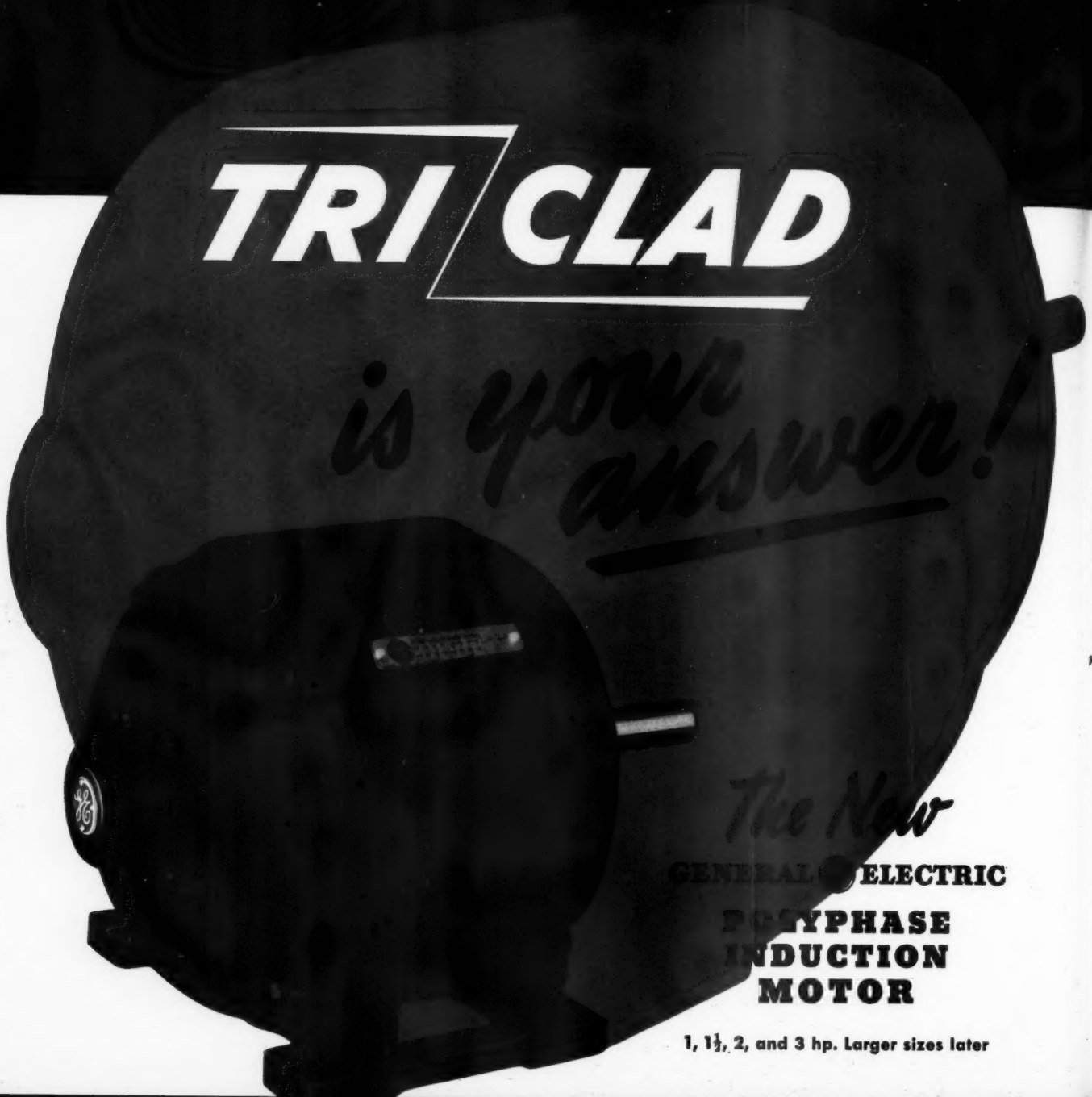
Mining methods and equipment are similar to those used in coal mines


GENERAL ELECTRIC
It's HERE . . .
the triple-tough motor
you asked G.E. to build!

We combined *500* man-years with *62* years

TRI/CLAD

is your answer!



The New

GENERAL ELECTRIC

POLYPHASE INDUCTION MOTOR

1, 1½, 2, and 3 hp. Larger sizes later

BUILT FOR PROTECTION FIRST

# of RESEARCH
# of motor EXPERIENCE

THE Tri-Clad motor is all new—and it's built to industry's own specifications. Five years of asking questions among motor users in all types of industry and studying industrial processes told us what you want in a general-purpose motor—what you want in styling—in convenience and adaptability—in extra protection on the job. At the same time, through its research and engineering organizations General Electric was developing new and unique materials, such as insulations based on synthetic resins; new manufacturing processes, such as the "booking" method of casting; and new ways of getting the most out of the active material in a motor, such as controlled annealing. Out of these new ways of doing things came the ability to build the triple-tough motor you asked for.

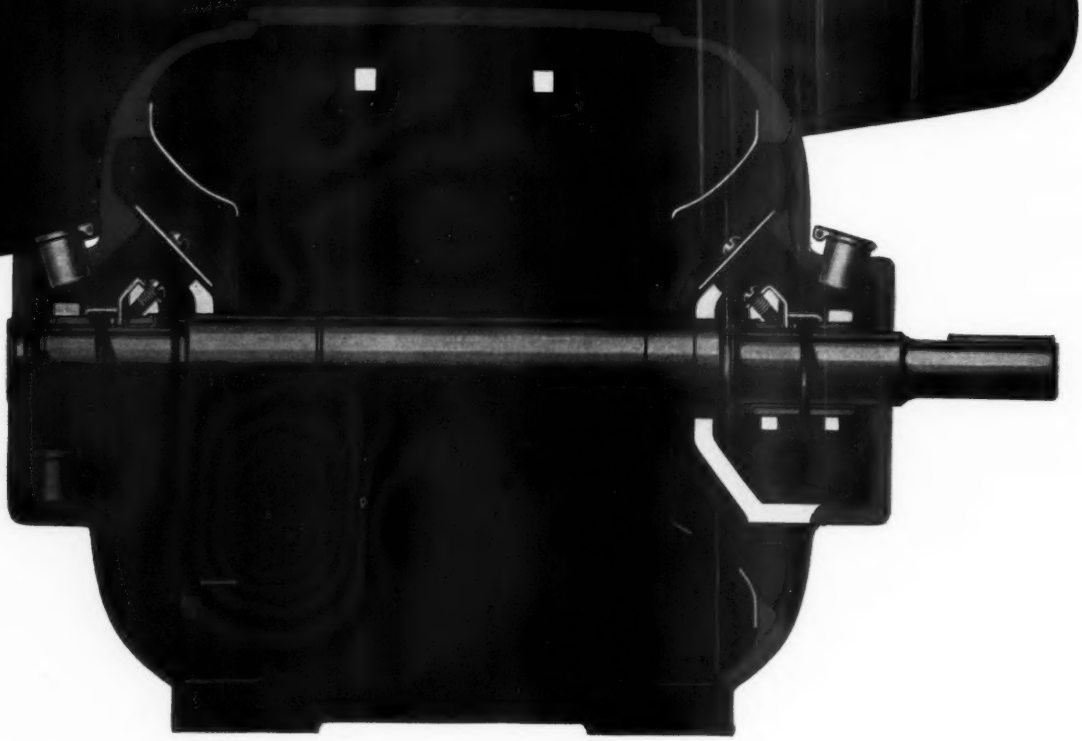
We call this new motor "Tri-Clad" because extra protection has been built into it in three basic ways:

1. The sturdy, cast-iron frame and end shields with no openings above the center line protect the vital parts against physical damage. There's no chance for falling materials or dripping liquids to get inside.
2. The new motor windings of Formex* wire, together with improved insulating materials and methods, give extra protection against electrical breakdown.
3. Fundamental improvements in bearing design give extra protection against failure or excessive wear in service. A scientifically improved lubricating system and double-end ventilation augment this protection.

Here's a test: Recall every point of weakness that has ever cropped up in a general-purpose motor to cost you money. Then check them against the features listed on the next page. Don't stop with protection; consider the characteristics, the convenience features, the sleek styling—even the paint job and the name-plate. We'll rest our case for Tri-Clad on how close it *then* comes to your ideas of what a truly modern motor ought to be. *Reg. U.S. Pat. Off.

TURN PAGE FOR INSIDE STORY

Check THIS "INSIDE STORY" OF MOTOR VALUE



- One-piece, cast-iron frame and rigid cast-iron end shields protect the motor against external blows and accidental abuse.
- Enclosed construction protects against entry of falling objects and dripping liquids; keeps chips and the like from vital motor parts.
- Low-velocity, double-end ventilating system provided by fans cast integrally with rotor winding keeps the motor running cool and prolongs insulation life.
- New winding methods give shorter end turns, reduce the number of internal connections, and improve characteristics.
- Mounting features adding to convenience include reversible stator and four-position end shields.
- Synthetic-resin insulating varnish, with exceptional bonding strength and high resistance to heat, bonds the conductors together and prevents movement of the windings.
- Steel-shell bearing linings of hard-tin-babbitt are of fundamentally new design and have a new method of grooving which provides positive lubrication for either direction of rotation.
- New and simple ball-bearing mounting assures correct alignment and exclusion of foreign materials. Easily cleaned and regreased by means of the G-E pressure-relief system.
- Big, roomy, four-direction conduit box is quickly removed from its base to give unrestricted working space for making connections. Flexible leads are clearly marked.
- Formex wire—the toughest magnet wire yet developed—assures a continuous dielectric film under the most severe conditions. Formex is highly resistant to abrasion, moisture, varnish solvents, and heat aging.
- End windings are coated with Glyptal No. 1201 red, providing a tough, hard finish that is highly resistant to heat, moisture, oil, and abrasion.
- One-piece cast-aluminum rotor winding with fans cast integrally is practically indestructible, has no joints, and gives a cool-running low-inertia rotor.
- All laminations, both in stator and rotor, are annealed for low iron losses and uniform characteristics. Special rotor treatment improves operating characteristics.

General Electric Company, Schenectady, N. Y.

GENERAL ELECTRIC

U. S. Now Independent of Foreign Sources

It will be apparent that far from being in any danger of serious shortage of potash, such as was experienced during the last war, the country is in a comfortable position. Aggressive and able technical development has made the United States independent of foreign sources of supply and all indications are that the industry will be able to keep step with both present and future needs of the country not only for fertilizer potash but also for chemical salts.

In connection with the latter, the amount of K_2O used outside the agricultural field is relatively small. For several years prior to 1938 imports ranged in the neighborhood of 40,000 tons per year equivalent K_2O distributed among 16 to 18 different compounds. In 1938 the imports of such refined potash chemicals dropped to 25,125 tons of K_2O and for 1939 there was a further decrease to 18,576 tons of K_2O. This decrease, particularly in 1939, is due in part to the effect of war and partly to an increasing production of such potash chemicals in the United States. The shrinkage of imports of foreign refined potash chemicals coupled with an adequate supply of American potash should lead within a very short time to the development of a completely adequate American refined potash chemical supply.

In contrast then to the situation during the first World War the potash picture in this country is quite reassuring. A new American industry finds a ready home market for its product and the potash consumer both in the agricultural and chemical field finds a vigorous young industry rapidly and efficiently expanding to make the country completely independent of all foreign sources of supply.

PHOSPHATES FOR 1940

By JAMES A. BARR
Chief Engineer
International Agricultural Corp.

IN general all branches of the industry, from mining to fertilizer and chemical manufacture experienced a material increase during 1940.

No important new sources of phosphates or new mining fields were opened up and the principal production was confined to the Florida fields, Tennessee brown rock phosphate areas, the Western states, and a small by-product production in Virginia.

In Tennessee there was a sharp rise in output in all grades, i.e., for furnace, fertilizer, direct application and general chemical outlets up to about 90 percent of plant capacity; that is the practical output limit. There were no new additions to phosphate mines or washers within the state and no change in methods used except that truck haulage is being increasingly employed to bring in phosphate matrix from smaller outlying and scattered deposits to the existing central plants.

Armour Fertilizer Works installed and placed a brown rock flotation plant in operation at their Century Plant to beneficiate lower grades of washed phosphate rock up to the higher grades required by the fertilizer trade.

Florida output ran along at a lower rate for the first part of the year but then started to rise rather sharply due to increased domestic demands, revival of export shipments and considerable demand for furnace grades.

Treatment of Lower Grades Increases Reserves

In both Tennessee and Florida flotation has resulted in increasing phosphate reserves by permitting the treatment of lower grades and recovery of deposits not suitable or practical of treatment by washing alone.

No new Tennessee operations are projected for 1941 except the new mining and washing plant now being constructed by the TVA on their property near Columbia, Tenn. The novel part of the project involves pumping the phosphate through a pipe line several miles in length from the mine across difficult country to the railroad loading site. The washed product will be shipped to the TVA furnace plant at Wilson Dam, Ala.

The Tennessee Division of Geology published Bulletin No. 48, "Phosphate Resources of Tennessee," which is a valuable addition to the phosphate library.

In the Florida mining fields there were no new or important changes or additions during the year.

Mining Practice in Florida

At present, the bulk of the Florida mined tonnage is produced by the usual practice of stripping the overburden by large electric draglines followed by hydraulic mining and pumping to washers followed by flotation plants.

There is now an increasing tendency to eliminate the hydraulic mining in favor of drag line mining. The excavated matrix is dumped into a pump sump and pumped to washers as before. The advantages claimed are: Saving in power due to use of much hydraulic water at lower pressure, and taking the mine pumps out of pit bottoms up onto the surface—thus facilitating moving of this heavy equipment as the mining progresses as well as lowering the pumping head.

Some matrix is hauled in side dump cars direct from mines to washer, eliminating the pumping steps. In general, these types of mining are being carefully investigated and tested along with new types of haulage such as Diesel and other high tonnage individual haulage units.

New Developments

New Florida installations during the year included a flotation plant at the mine of the Phosphate Mining Company near Mulberry where fertilizer grade phosphates are being recovered from washer tailings or waste.

The International Agricultural Corporation enlarged their central dry grinding plant by the addition of one of the largest Bowl Mills together with

storage and loading facilities. The demand for ground phosphate is increasing.

There was remarkable progress registered during the year in the furnace and chemical branches.

The TVA continued regular production of phosphorous and phosphoric acid for conversion to super and meta phosphates. Both Florida and Tennessee phosphate rock were used in the electric furnaces.

Monsanto Chemical Company has added another large electric furnace for the production of elemental phosphorous to their plant near Columbia, Tenn.

The International Agricultural Corporation has installed a unit for production of defluorinated phosphate at their Wales, Tenn., plant. This product is used to replace bone meal in animal feeds.

The Phosphate Mining Company is constructing a unit for the production of phosphoric acid by wet methods, which will supplement the output of their electric furnace.

Chemical Usage Increasing

The chemical end of the phosphate industry has shown remarkable progress in the last few years. For example, phosphoric acid production, basis 50 percent H_3PO_4, was approximately 78 million pounds in 1937. This figure was doubled by 1939 and will show a corresponding increase in 1940.

Sodium pyro phosphate is the only sodium phosphate salt to show any material increase. The production of pyro phosphates increased from approximately 10,000 tons in 1937 to about 42,000 tons in 1940. Its use and production is being rapidly increased.

Rust proofing and metal cleaning requirements accounted for 11 million pounds 75 percent phosphoric acid in 1939 and the consumption is increasing.

The new uses of organo-phosphates account for the greatest advance in the phosphate chemical output, having increased ten-fold since 1935 and as a whole this branch has doubled its output every two years since 1933.

Organo phosphates are used in the manufacture of certain plastics; as a catalizer in the polymerization of oil refinery gases and as an inhibitor in the production of extreme pressure lubricants which are of great importance in the development of modern high-speed engines and in other equipment having heavy bearing pressures.

METAL MINE SAFETY in 1940

By HARLAN A. WALKER
Assistant General Manager
Homestake Mining Company

Metal and non-metallic mines are pushing for production—a condition which can lead to a rise in accident frequency unless increased attention is paid to safety precautions. Therefore this study of mine safety is particularly timely now.

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DURING 1940 the National defense program heavily stimulated activity in all types of metallic and non-metallic mining. This will probably result in a marked rise in accident frequency and fatalities with a consequent stepping up of accident rates. In the opening of abandoned properties or small new ones there are necessarily many inherent dangers which may only be minimized as operations become stable. In the search for strategic minerals there is a tendency to take greater risks in ventilation, dry drilling and other hazards. The use of electric cap lamps does not assure the wearer of adequate protection in the case of bad air.

Mine fatalities just prior to and during the World War were markedly higher than they have been since that time and it therefore behooves the mining industry to give special attention to accident prevention during the current world crisis.

Frequency and Severity Rates High Compared to Less Hazardous Occupations

The National Safety Council in its Accident Facts for 1940 states that in 1939 disabling injuries per million man hours were the highest in lumbering with 45.46, followed by mining with 31.93, and construction 28.81; but the days lost per thousand hours were highest in mining with 9.68. They classify accidents as a whole as being due to (a) personal causes—through lack of knowledge or skill, 48 percent; improper attitude, 31 percent; bodily defects, 3 percent; no personal cause, 18 percent; total, 100 percent; (b) mechanical causes—because of hazardous arrangement, 34 percent; defective agencies, 18 percent; unsafe apparel, 15 percent; improper guarding, 9 percent; improper lighting or ventilation, 2 percent; no mechanical cause, 22 percent; total, 100 percent. In mining and quarrying they classify types of accidents as due to falling objects, 35 percent; vehicles, 21 percent; handling objects, 15 percent; hand tools, 7 percent; all others, 6 percent; machinery, 5 percent; falls, 7 percent; and stepping on or striking objects, 4 percent.

The 1939 injury rate computed by the National Safety Council for mining gave 31.93 for frequency and 9.63 for severity which compares unfavorably with industry as a whole with 11.83 and 1.42. Mining severity has gone up as frequency has gone down in the past 13 years.

Bureau of Mines Training

United States Bureau of Mines reports show that up to July 31, 1940, 1,298,867 persons received first aid training since the fall of 1910 and during the same period 70,201 took the mine rescue course. Out of 100 industrial accidents not more than 2 are unpreventable, 88 represent human failure, and 10 are caused by mechanical failure.

Causes of Multiple Accidents

Although there were no major metallic or non-metallic mineral mine disasters reported during the year there were several with more than one person killed or injured, primarily because of blasting or fumes. The causes of such fatalities vary little through the years and are normally due to short fuses, delay in "spitting" fuses, careless tamping, cleaning out or drilling into missed holes, or asphyxiation. Some accidents result from double priming and spirited discussions between explosives manufacturers and experienced operators have failed to define the correct place for the priming stick. Notwithstanding the obvious advantages of electric blasting caps, especial care must be exercised in their manipulation to protect them from stray currents or lightning.

The grave danger of fire in mines having but one opening has again been brought out with one incident this year. Several small mine fires have been brought under control through the use of properly located ventilation doors and reversing fans. Great care should be exercised in the use of oxygen-acetylene welding torches where sparks might either directly or indirectly ignite timber or refuse.

Commendable Safety Records Achieved

On the Gogebic range the Newport Mine early in 1940 completed a full year comprising 515,190 man hours without a lost-time accident. Two other mines, just prior to this, made records of 685,176 and 36,069 man hours, respectively, without lost time. Tunnel driving has made new highs in safety. The 85-mile-long Delaware aqueduct job has an accident record 20 percent below that originally estimated for the job. In a number of small operations in a western state, mining and prospecting for strategic minerals showed a high accident rate which was reduced 60 percent through a campaign of education and instruction on safety practices with resultant benefits to both large and small operators.

The Mount Weather experimental mine of the United States Bureau of Mines carried on interesting research throughout the year and issued several important bulletins, two of which were on dust and gases.

In the minimizing of dust generation diamond core drilling, seems deserving of consideration, also the use of relatively large diameter core drilled holes for connection between levels, in raises and the like. The use of smaller gauge steel in drilling is proving to be an important factor in reducing dust hazards. The study and prevention of dust hazards in mining should have definite recognition in all well integrated accident prevention programs through laboratory and field research, ventilation control, improved blasting practice, air line respirators, filtered blower intakes, efficiently maintained individual respirators, spraying systems and numerous other aids.

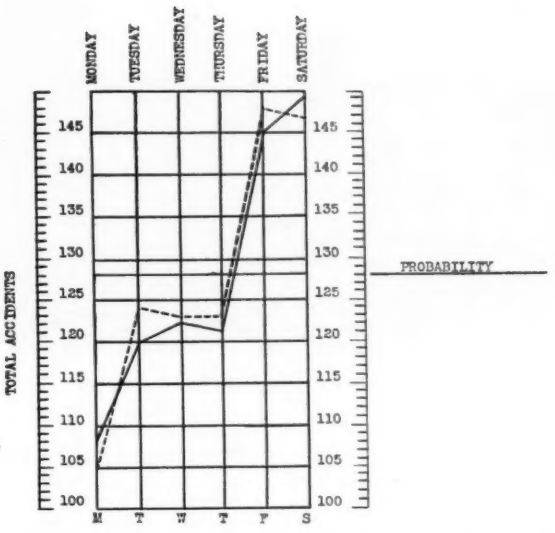


Figure 1. This graph of "Lost Time Accidents According to the Day of the Week," is illustrative of special studies which may be made of accident data. It indicates minimum proneness to accident following the long rest period, i. e., Sunday, and maximum frequency at the end of the work week when the workman is most likely to be fatigued

Organization Must be Constantly Alert

Safety engineers and inspectors as well as supervisory forces all too often allow themselves to get in a rut and overlook important safety factors and hazards in the course of their daily rounds. They should do their utmost to look ahead and visualize what might happen under given circumstances. Safety inspectors should have breadth of vision, an intimate knowledge of the operations and should above all, through the exercise of diplomacy and tact, gain the full confidence and respect of the men. When training foremen and shift bosses in accident prevention it must be remembered that many workmen resent being told the details of handling their particular operations or of any intimation that they are incapable of self-protection. Hence the importance of diplomacy and tact.

In reporting accidents and their classification the tendency is to "pass the buck" to the workman when actually the foreman, shift boss or others are at fault. If too many accidents are so classified then this is a direct reflection on the shift boss and foreman. No one should be in a supervisory capacity unless he has the welfare of his men at heart; only then will he do everything in his power to further safety.

Truck Mounted Rescue Equipment Faster and More Flexible Than Railway Car

In the Coeur d'Alene district, a mine rescue truck has been placed in service with sufficient equipment, breathing apparatus and supplies for a crew to operate for 24 hours. With this mobile rescue unit contact with any mine in the district may be made within an hour from the time the truck leaves its base at Wallace. This is much quicker and more flexible than the old system with a railroad mine rescue car.

Safety Campaign Effective

A large mining company instituted an intensive safety campaign which has resulted in an enviable record.

Yates hoisthouse, Homestake Mining Company

There, as in many other properties, the shift boss by securing the confidence and cooperation of his men, has been the primary factor in the success attained. On the other hand if he is careless or indifferent he can do more damage than a corps of safety engineers. Each shift boss must have six months training in the safety department during which time he acts as safety inspector underground, trains first aid groups, makes out safety reports and statistics, and studies the general mining practice as a basis for recommended changes and improvements. He cannot be promoted to division foreman until he has passed this course—through which he learns in practical manner how essential cooperation is between the bosses and the men.

At one large mine a study of accidents by time and season of occurence shows that the most prevalent time is the third and seventh hour of the shift, and in the months of December, January, and February. The hours of occurrence would indicate that the accidents are more likely to happen when the man is at the point of lowest physical resistance.

"Repeaters" Are a Special Problem

A recent article on highway accidents brings out the fact that many are caused by "repeaters," that is, drivers who have been involved in two or more accidents. Examination by doctors and psychiatrists frequently reveals minor physical or mental defects which upon correction largely eliminate their driving handicap. Might not the same hold true in mining? Are there not men who are frequently hurt, who are misfits in their work or who have the handicap of some minor physical or mental defect which if corrected would make them more careful workmen?

Observance of Rules Necessary

Mine safety and accident prevention will progress primarily in three manners: (1) through mechanical betterments; (2) careful training of personnel; and (3) development and analysis of accurate accident records.

Mechanical safety betterments comprise (a) good housekeeping; (b) design and installation of safety barriers as far as possible for all dangerous mechanical and physical points of danger; (c) care in the design of original equipment; (d) safety clothes and equipment, such as hats, goggles, gloves, hard-toed shoes, respirators and electric lamps; (e) proper location of mechanical equipment both stationary and mobile; (f) development of special safety devices.

Good housekeeping is of paramount importance in the promotion of safety. Surface buildings both inside and out should be kept free from unnecessary debris, tools and other foreign objects which might create hazards. Some companies are whitewashing the outside of their buildings from ground level up about two feet in order to make a contrasting background for objects left lying along the edge of plant buildings. In building interiors where there is considerable smoke and grease (which makes it difficult to keep windows clean) the walls are painted with aluminum paint from the floor level up for four to five feet so as to reflect more light in an otherwise dark building.

Shop buildings should have painted aisleways for passage of the workmen and supervising force back and forth and care should be taken not to permit foreign materials of any sort whatsoever to be left inside the safety zones.

Underground shaft stations, drifts and other mine workings should be kept as clean as possible. Materials which must necessarily be left in the shaft stations should be neatly piled in such manner that there is no danger of their tipping over. The same applies to materials in mine yards in and about the shaft collar.

Every effort should be made to erect adequate safety barriers wherever necessary in front of any point of danger such as open winzes, shafts, or other mine openings. Ventilators, motors and moving parts of ventilators, pumps or other equipment should be properly housed so that there is no chance for a workman to catch his clothing in them and, at the same time, should be properly grounded to obviate the possibility of electrical shock. In raises and winzes, sollars should be placed at frequent intervals so that if a man falls from a ladder he will drop only a short distance. Ore passes and grizzlies should be properly covered or fenced.

The mining industry should always look at a new piece of equipment from the safety standpoint. For example, if moving parts have protruding set screws or similar projecting objects these should be brought to the attention of the manufacturer with insistence that the proper remedy or correction be made before accepting the equipment. It must be remembered that machinery manufacturers depend to a great extent upon observations and suggestions from the field in the design of their products and it is the duty of mine operators to cooperate with them to the fullest extent in working toward safe equipment.

Proper Clothing and Accessories a Factor

Safety clothes mean much in the promotion of safety. These include hats, goggles, gloves, hard-toed shoes, and many other articles of like nature. It has not been many years since it was a problem to introduce hard-boiled hats but eventually their use became standard and the records speak for themselves as to what has been accomplished in furthering safety by that one factor alone. In like manner, goggles and hard-toed shoes have been important in minimizing accidents. Better lighting underground in recent years has been receiving increasing attention both with electric cap lamps and flood lighting of stopes and has had its share in safety progress.

Mechanical equipment should be carefully located from the standpoint of head room, clearance, lighting, ventilation, unnecessary noises and general accessibility. All too often a pump, motor, ventilator or other sta-

tionary equipment is placed in such cramped quarters that it is difficult properly to service it without undue danger. Similar unsafe conditions may arise through inadequate ventilation or lighting or both. Mobile equipment, such as cars, motors, shovels, should be carefully checked for track or roadway clearance and head room.

In the development of special safety devices both the research laboratory and field operator play important roles. Modernization of shaft signalling, better safety devices in high speed hoisting equipment, new applications of the photo-electric cell and many others contribute their part in accident prevention.

Personnel Training and Safety Inspections Important

The field of personnel training embraces (1) basic safety organization; (2) safety talks and discussions both through individual contact and meetings; (3) advertising and publicity; (4) care in the training of new workmen and periodic checking of the work habits of old employes; (5) safety inspections by workmen's committees and the supervisory force; (6) first aid and mine rescue training.

It is a much argued question whether safety bonuses aid in accident reduction. In many instances trophies such as fobs, buttons, or other appropriate safety emblems have a more lasting value than money awards.

In safety inspections a check list for the use of foremen, shift bosses and the safety committee is of great aid. Such a list for a mechanical department would include some of the following typical questions: (1) Are the men safety minded and are they willing to cooperate with each other in maintaining a safe plant? (2) Is good housekeeping a general practice—are aisles clear of stumbling blocks, debris, grease and oil? (3) Is stock piled neatly and safely? (4) Are there any exposed live wires, broken sockets, plugs or switches with which employes might make contact? (5) Is machinery in good working order—are the small tools, chains and ropes in good condition? (6) Do all workmen wear goggles when necessary? (7) Do all workmen wear safety shoes, and other safety garments when necessary? (8) Is there an absence of ragged shirt sleeves, trouser legs or other loose articles of clothing which might be caught in a gear, belt or pulley? (9) Are the men encouraged to get first aid treatment for minor injuries? (10) Do the men observe fundamental safety precautions in regard to lifting heavy objects off the floor, pulling on wrenches, striking a chisel? (11) Are there any low doorways or lack of head room? (12) Are safe stools and ladders provided? (13) Are the plants properly ventilated and lighted? (14) Is the area free from grease and oil where oxygen-acetylene welding is done? (15) In electric welding is the insulation on the extension cord in good condition—are screens used to protect nearby workmen? (16) Are machines wiped or oiled while they are in motion? (17) Is there a relief operator or engineer available? (18) Are there any fire rules, and are they understood by every employe? (19) Are there sufficient fire extinguishers and hoses, and does everyone know where they are located? (20) Does everyone know where the fire alarms are located?

The questionnaire should be followed by a space for remarks and recommendations. The questionnaire is not all inclusive but is merely employed as a guide to assure coverage of the major points in question.

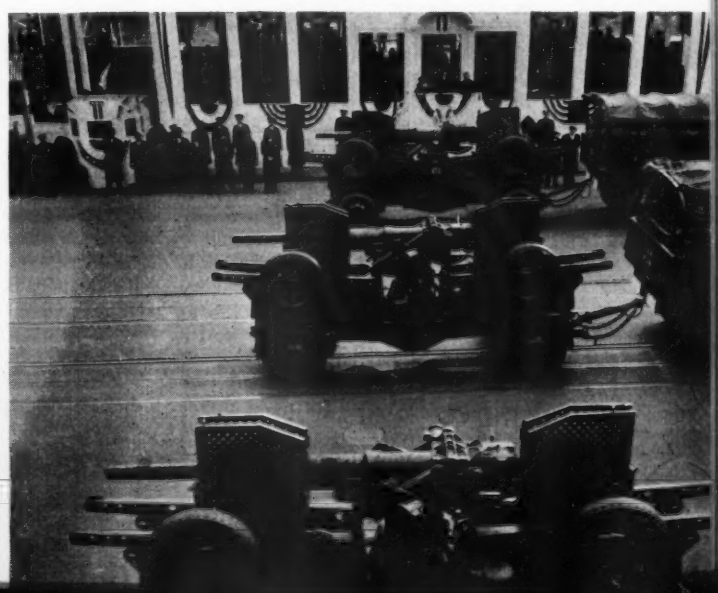
Statistical Data Show Points Needing Special Emphasis

Statistical data of both lost-time and near accidents give an accurate picture of the relative risk of different classes of work and may lead to a logical remedy. An individual case history of an employe may reveal proneness to accident, whereby re-examination and analysis will permit of corrective measures. Specific safety rules to be of value must not only be learned but must be coordinated with the work program. Monthly reports on "Parts of Body Injured" and "How Injured" should be made. Graphs of frequency and severity rates sharpen the minds of management and the supervisory forces on the accident trend.

First aid and mine rescue training have long been recognized as basic functions of well integrated mine safety programs. Innumerable examples might be cited of lives saved and accident severity reduced by the application of one or both. The records of accomplishments in these regards speak for themselves.

In mining operations the success of a safety program lies primarily with the shift boss and his men, and the degree of its accomplishment is largely measured by the extent of their cooperation. Management has a very definite obligation to spur on the whole organization to new advances in safety technique. Nor should accident prevention be allowed to degenerate into a piece-meal disconnected program; rather it should be one which shows careful planning and wise coordination wherein all the organization from top to bottom will do its part.

Hand in hand with safety should go the welfare of the workman in matters of personal health, for a contented employe on the job means a more careful workman.



GOLD—What of its Future?

● ***No question is of greater moment to the future peace and prosperity of the world than the subject here discussed. With over $21,000,000,000 in gold stocks already in this country what can we do about it?***

By THOMAS M. McNIECE
Economist
New York City

FOR centuries past man has struggled and died in the search for the yellow metal. Now, with the golden stream flowing over our shores, we are worried by the mere possession of it. And it is well that we should be concerned because gold and the policies that govern it are of vital importance to the whole nation.

There are a number of reasons why this is so. One is the great importance of gold in its relation to money and commodity prices or, if you please, to the ability of the American citizen to make his income cover his cost of living. Another is concerned with our gold and monetary policies which so vitally affect the level of our business economy and therefore our chances to earn any income at all. Another is the relation of our monetary policies to the purchasing power of our savings whether they be in the form of bank deposits, insurance, securities, or fixed property. This is especially important because such savings, for the most part, represent a lifetime of effort on the part of a great mass of citizens who may not have the opportunity to make up the losses that come with depreciating money.

The American public needs to be awakened to a full realization of the importance of money in its life's program. Uncertain money value is a new experience for present Americans. From the top executive down to the lowliest wage earner and the widows and orphans who come in between, the dollar has been taken for granted and has, therefore, been out of mind. This is so because it has been anchored to gold and not subject to the uncertain influences of monetary experiments and political fancies.

Gold and money have become increasingly significant to us in the United States, largely because we have chosen to follow certain policies with them that are without parallel and apparently without justification. The importance of gold to all the people lies in its monetary uses, but no one can appreciate more than the men who mine it, that it is also a commodity, produced, and sold and bought in the same sense as any other commodity. This dual nature of gold injects many complications into the problem and to some extent is responsible for the confusion that often creeps into our consideration of these questions.

Presumably a large portion of the men here today are engineers. Engineers must perforce, give due weight to all the facts. If they do not, the tunnel may collapse, the boiler blow up or the bridge fall down. We not only need to know more facts about gold and money and prices but we need to know more about their interrelationships.

The time available to us today will not permit us to make a full appraisal of all these factors. Nevertheless, we must review a few of the recent and outstanding developments that have been largely instrumental in producing the present gold situation. When we have done this, we shall be better fitted to take the forward look in which we are all so interested.

The Paper Money Tailspin Begins

Immediately preceding the long depression that began in 1929, about the only serious doubt that existed about monetary gold was its scarcity. No one seriously questioned its distribution, but the experts of various lands were fearful that the amount of monetary gold available was not sufficient to support the volume of trade then prevailing.

Several currencies began to weaken in 1930, but the real fun began when the pound sterling fell off its golden pedestal in September, 1931. The whole sterling area was shaken up and a widespread retreat from gold was under way. There was no question about the necessity of the step taken by the English authorities. Their gold reserves had been seriously drained away, no immediate chance for replenishment was in sight and an unfavorable trade balance was bound to continue.

When the English pound declined, the sterling paper price of gold moved up. This had two quick effects on gold:

1. Great quantities were sold in London especially in 1932 from hoarded supplies. Much of this came from the Orient.

2. The production of gold, already increasing, was greatly stimulated.

This marked the real beginning of the recent, rapid increase in the world's monetary gold stocks. The increased sterling price of gold was equivalent to a decreased gold value for sterling. The less a money is worth, the more of it has to be exchanged for a commodity, other factors remaining the same. The long decline in sterling paper prices of commodities was arrested, but in the United States, France and other countries which remained on gold, commodity prices continued to decline. By the end of 1932 this decline was halted. The floor of the valley had been reached.

In 1932, the United States gold reserves were diminished, in part no doubt, by the same influences that caused dishoarding abroad and in part by economic conditions within the United States.

The Slipstream Hits the Dollar

The run on our gold was soon checked and by early 1933 our monetary gold stock was again in excess of 1927-1929 levels. Nevertheless and without financial necessity for it, the recapture of gold from American citizens was begun in March and the export of gold forbidden in April, 1933.

The real objective of dollar depreciation initiated at this time was to raise the commodity price level, especially of raw materials and farm products. One of the purposes behind this was to facilitate the payment of maturing debts that had been contracted at much higher price levels.

By the time the dollar was taken off gold, world gold prices of commodities had stabilized. Prices of world commodities, including the products of both mining and agriculture, then rose in the United States as the price of gold increased in terms of the depreciating dollar. Prices of semi-finished and finished products improved but at a slower rate.

The dollar price of gold drifted from March, 1933, to January 31, 1934, when it was pegged at $35 per fine ounce or 169 percent of its former long-standing price. This marked the beginning of the gold rush to the United States. The British, pursuing a different policy had no fixed sterling price of gold between September, 1931, and September, 1939, when war was declared on Germany. Since that time, the sterling price of gold has been 168 shillings per fine ounce or 198 percent of the official price paid for many generations.

Hi-jacking Gold

At this point in this bare recital of facts leading up to our present dilemma, we must mention one or two more that should give us pause. We refer first to the commandeering of all privately held monetary gold and second to the repudiation of our national pledge to pay our obligations in dollars of specified gold content. Through all these financial trials besetting nations far less fortunate than our own, we find no other government that stooped to the immoral practice of confiscating its citizens' gold and then raising the price. Nor does it throw any mantle of righteousness around the act to make private ownership of gold a crime and to suggest that the end justifies the means. And why should the resident of foreign lands have access to our gold while it is denied to us?

Pouring gold at the Philadelphia Mint

United States Government—Hoarder No. 1

Having made hoarding (or even owning) gold a crime among its citizens, the United States Government became the leading gold hoarder of all time. This is a manipulative corner on the commodity gold, that has the evil effects usually associated with similar corners on copper, wheat, rubber, or any other commodities. One point of difference is that no one can escape the results of the corner on gold because it does affect our money structure. Another word on this a little later.

Gold and Commodity Prices

The foundation of the price structure in any country is the world price level in terms of gold, that is the gold price level of world commodities moving freely in trade among the nations. The domestic, paper money price level in any country is then determined by the level of world prices in gold modified by the gold value of the paper money of the country.

Commodity prices are then governed jointly by commodity supply and demand and the value of money. There are several factors that influence the value of money but it is sufficient for our purpose to consider this value as a single item or variable. The three factors, commodity supply, commodity demand and the value of money all work simultaneously but independently on the price level—sometimes in unison and sometimes in opposition. This is important in our consideration of the gold problem.

Our government depreciated the dollar, primarily in order to raise commodity prices. In a number of cases it sought to reduce the supply of certain commodities to achieve the same end. But these price raising devices have been largely nullified by other policies which have diminished the demand for goods and which tend to increase the value or purchasing power of gold while its price remains fixed at $35. It has been commonly accepted for a long time that a hoarding movement by a large number of individuals is highly deflationary on prices. Hoarding by government does the same thing and the United States Government is the Number One hoarder of all time. Thus the inflationary influences of the first two factors have been nullified by the deflationary effects of the latter two factors of diminished demand for goods and large-scale gold hoarding. World-wide demand has also been reduced by war with its blockades, quotas, embargoes, prohibitive tariffs and exchange control.

Benefits to Gold Producers

These factors are all uniting to help the position of gold producers. At top prices, nations are buying all the gold that can be found and produced. At the same time, the deflationary forces or at least, the inflation antidotes are temporarily in command and retarding the increase in prices of material and labor that make up the cost of producing gold. When this increase in cost of production does occur, there will first be a shift from low to higher grade ores but finally a reduction of

output. All this is predicated on the assumption that the dog doesn't begin to chase his tail or, in other words, that governments do not continue to jack up the price of gold. Excessive governmental expenditures all over the world as a result of wars and extravagant experiments make it very unlikely that prices of gold will be reduced. This assumes a sane realization of the situation. Irrational policies cannot be predicted.

This favorable position of gold producers will end when any one or a combination of the following conditions comes to pass:

1. When world-wide physical demand for goods again overtakes supply—that is, when we get back to previous living standards; or

2. When inflationary forces turned loose by continuing budgetary deficits and excessive national debts drive material and labor costs skyward.

3. When major governments go broke (and most of them are approaching that point if they are not already insolvent).

Rising costs from the first and second causes may wipe out profits and reduced demand resulting from insolvency of governments may ultimately stop sales. Probably none of these contingencies is in the immediate foreground.

As material and labor prices rose during World War I, the buying price of gold remained fixed and production declined until in 1922 it was at approximately the levels of 20 years before. After the great price collapse of 1920-21 was translated into reduced production costs, gold output began an increase that has continued to the present time. It is now pertinent to ask what all of these influences we have been discussing have done to the production and distribution of gold.

Production of Gold

Over the past 100 years, the annual output of gold in fine ounces has been very erratic, but has nevertheless followed a reasonably uniform trend line. This trend line furthermore virtually parallels the trends of monetary gold stocks and of the world's physical production of goods. This means that over the long pull, the output of gold has kept pace with the production of other goods and world monetary gold stocks have traveled along. Even at the high levels of the past few years, the output of gold has barely reached its long-term trend. It was far above this trend in the peak between 1850 and 1870 and again between 1905 and 1915. In our quickening concern about the great increase in the production of gold, we tend to overlook the fact that it started from relatively low levels.

There are three principal outlets for gold production. These are monetary stocks, the arts and personal or private hoards.

Monetary Stocks, the Cornerstone of Gold Producers' Markets

For the 80-year period between 1850 and 1930 an average of about 57 percent of gold production was added to monetary stocks. At no time in this long interval did annual additions to monetary stocks equal the output. A different story is unfolded for the decade between 1930 and 1940. For these 10 years, an average of nearly 108 percent of production was added to monetary stocks with a high figure of 158 percent in 1932, the peak of the dishoarding movement.

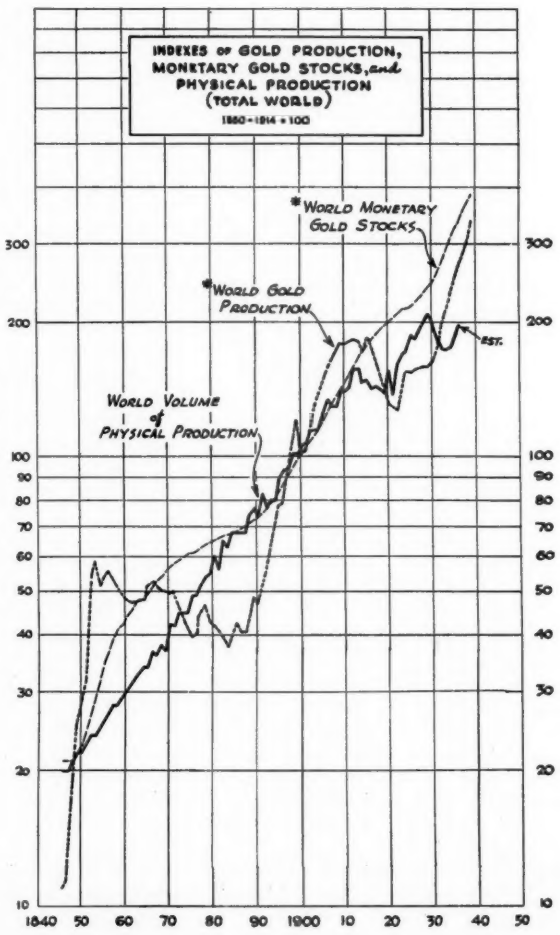
Thus, the high paper money prices for gold have cornered the market for it. The tide, however, is turning the other way. From a high index of 158 percent of its 80-year average in 1932, the additions to monetary stocks have been receding until they were about 100 percent in 1938 and between 85 and 90 in 1939. Gold has not lost its attractiveness to individuals. Given the opportunity and incentive, hoarding by those who usually hold wealth in this form will again begin. The attainment of former levels of economic activity will mean an increased demand for the arts. If, as some say, the world-wide conflict marks the beginning of another "Dark Ages," the future will not be so clear.

The upward trend of world monetary gold stocks has been remarkably stable through the past 100 years and no doubt will remain so for an indefinite period. There are two reasons for this:

1. Monetary stocks have a preemptive call upon gold output, that is governments have the authority or the means to acquire whatever proportion of output may be needed at any time.

2. Monetary stocks are an accumulation since the beginning of the first organized use of gold as money.

These stocks are now so large, that even at the peak output of 1939, it would take the entire production for 22 years to double their quantity. When the total annual output of gold is less than 5 percent of accumulated monetary stocks, fluctuations in output for a few years will have rela-



Stocks and production of gold rising rapidly

tively little effect, especially in view of the power of government to control the stocks.

Present monetary gold stocks are higher than needed to support existing levels of trade, but this is because trade volume is unusually low and not because gold stocks are abnormally high. Monetary gold stocks are now correctly proportioned to maintain world production and trade at customary levels of progress based upon prior standards of living or consumption. Unsound economic and monetary policies which discourage improvement in production and trade and therefore diminish the need for additions to monetary stocks would ultimately be disastrous to gold producers.

If we conclude there is no cause for immediate alarm about world gold production and monetary stocks, what can we say about its distribution?

Distribution of World Monetary Gold Stocks

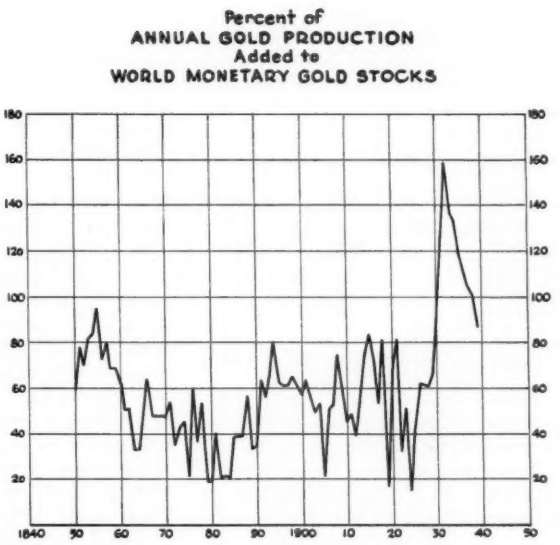
The distribution of monetary gold stocks is no doubt a cause of greater concern to us at the present time than the possibility of over-production. The gold stocks of the United States are now in excess of 21 billion dollars and comprise about 74 percent of the world's total. Nevertheless, the situation is not nearly as top-heavy as these figures and newspaper headlines suggest. The question is not so much how much we have as it is whether other countries have enough or can get enough to meet requirements.

As previously stated, the great gold rush started for the United States after January 31, 1934. It has moved at an irregular pace ever since, stimulated by all war scares in Europe and receding greatly between them. A study of the production and stocks of the various nations yields some interesting and significant results. Since the United Kingdom, beginning early in 1939 has concealed the true extent of her gold holdings, we shall analyze the data for the five-year period between December, 1933 and January, 1939.

For this interval and in terms of present dollars, our monetary stocks increased by $7,691 millions or about 113 percent. In round numbers, this great increase was derived from the following sources:

From new production	74%
From stocks of other countries	16%
From dishoarding	10%
Total	100%

Graph is resuming normal level after dislocation of the '30s



These figures indicate the net result of all transactions. Actually, we received about 32 percent of the increase via the reserves of other countries, but one-half of these shipments were replenished from new production or dishoarded funds. The percentage increase from dishording is based on the assumption that all newly mined gold went into monetary stocks. The fact remains that enough newly mined gold was produced to account for 74 percent of our increase and this is the important point.

More light can be thrown on this problem by comparing the gold stocks of various countries as reported in the Federal Reserve Bulletin. In this case, we can eliminate the United Kingdom from consideration and compare stocks between December, 1933, and December, 1939. To make a later comparison is futile because in recent months, records are not available from combatant or conquered nations. Out of 29 major countries considered, 14 show increases in their gold stocks, 13 show decreases, and 2 no change in this six-year period ending the first of this year. Ninety-seven percent of the decline shown by the 13 countries indicating decreases occurred in the stocks of France, Italy, Japan, and Switzerland.

These data suggest that disregarding the current results of the present war, a relatively small percentage of our stocks came from the reserves of other nations. They also show that other nations are not unloading gold, but as far as possible, are maintaining stocks at levels comparable with those before the avalanche descended upon us.

A point often overlooked is that all of our enormous gold stock does not in reality belong to us. There are foreign funds of abnormal amount in the United States that are a lien upon our reserves. While these are being diminished to some extent by the purchase of war goods, the total is probably in excess of 25 percent of our gold stocks. Our gold reserves would be materially diminished if these funds should be called home. Incidentally, their value would be greatly depreciated if they should remain here and gold be demonetized.

What do these facts suggest about the future of gold?

The Future of Gold

One cannot be very positive in answering this question without sticking his neck out so far that he becomes very vulnerable from all sides. The new-fangled divining rods now in use may aid in locating the presence of gold but not its future.

The fears now expressed about the future are of three varieties:

1. Demonetization of gold by other countries.
2. Reduced value of gold on account of abnormally large stocks.
3. Enlarged credit base that might bring a disastrous "credit inflation."

The effect of any of these would be to run up prices.

With reference to the first point it may be repeated that the care with which other countries are guarding their reserves does not indicate any attempt to dump gold. Countries which produce gold as well as those who possess it have an interest in maintaining its position.

At least 55 percent of the output of gold comes from the British Empire and those countries can be relied upon to do their part in maintaining the monetary functions of gold.

The real economic importance of gold production to a country may,

in a sense, be expressed by its annual per capita output. For the five-year period from 1934 to 1938, the average annual output of the principal producers was approximately as follows in terms of present dollars:

	Per Capita	Percent of World Total
South Africa	$42.00	34.8
Canada	12.00	11.6
Rhodesia	10.00	2.4
Belgian Congo	8.00	0.7
Australia	6.00	3.6
United States	1.20	12.9
Russia (estimated)	1.00	14.8

Mexico and Chile each have a per capita output slightly in excess of the United States.

These producers and others may be counted upon to oppose any effort to demonetize gold.

Barter versus Gold

Perhaps the greatest fear of gold demonetization currently arises from the threat of Germany to outlaw gold in the event of her victory in the present conflict. In this case, especially, we should be careful to substitute reason for hysteria. It is by no means certain that Germany can win this war. In the event that she does, she and none of her allies will be in any position to dominate the world and make all the rules of the game.

Barter cannot be used as a substitute for gold and Germany does not prefer barter regardless of statements by leaders whose word has failed in the past. She adopted barter as a last resort, when her gold and foreign exchange reserves were exhausted. She was then driven into some hard bargains in her necessity for continuing her imports of raw materials. Through all her struggles to maintain these imports of foods and raw materials and when her barter deals were most numerous, she bent every effort to secure all the foreign exchange available, even at considerable domestic sacrifice in other lines. This would not have been necessary if barter was sufficient. As she has taken over one country after another, Germany has reached for nothing more quickly than for the gold and other financial assets of those countries.

Technically, barter cannot work in this age unless we revert to living standards of many centuries ago. This in itself would promote revolutions all over the world. Even if it could be made to work, barter would require complete and unqualified multilateral cooperation throughout the world—a condition impossible to realize. International trade involving the exchange of goods of differing seasonal characteristics cannot be consummated under barter. Credits or settlement of international balances with gold are the only means of bridging these gaps and who is going to hold the bag under the former necessity.

Pure barter is a relic of the past and it is a relic because it is obsolete—outmoded by more effective methods. And yet, it is possible to conceive of modern trade as partaking of the nature of indirect barter but only through the full utilization of gold. In its normal usage in international trade, gold is shipped only to settle the balances between countries created by trade and services of unequal values. The free operation of foreign exchange markets provides a place where international debtors and creditors meet, barter their obligations and settle the differences with gold. The only reason for differences is that obligations cannot be made to balance by this barter. If balances are to disappear, somebody has to take less goods. The world has not yet produced a substitute for gold.

Reduced Value of Gold

The fear that a surplus of gold will lessen its value arises in the belief that the world possesses a great overabundance today. It is well to understand that the realization of this characteristic of gold is consciously or unconsciously a recognition that gold while money is still a commodity that depreciates in value as an overstock accumulates. When the price of gold is pegged under these conditions, the decrease in value or purchasing power works itself out as a rise in commodity prices.

With reference to this condition, we must repeat that the quantitative stocks of world monetary gold are today well balanced with trade requirements, providing we and the rest of the world recover both our sanity and our former standards of living. A reduction in the value of monetary gold because of surplus stocks results in a corresponding rise in prices, but such changes occur so slowly that they involve no real hardships such as those occasioned by the quick variations that so often occur in the value of paper money. It is about time for economists, business men and politicians to realize that gold itself does not and has not failed as money. Any lack of stability in value that may have occurred is not inherent in gold but originates in mismanagement of human affairs by men. Wars, economic and financial blunders and political fancies may and do overload the financial structure at times to the point where any foundation may weaken. There is no conceivable base for money that can be proof against all the absurdities of men. Even the earth is shaken by earthquakes.

Credit Inflation

The third basis of fear expressed over our monetary gold is "credit inflation." This is a convenient term to cover a lot of misunderstanding. The existence of a large foundation for credit is presumed to provide a basis for *too much* credit. But can there be too much credit if each individual credit transaction is a sound one? Again, the monetary medium itself seems to be carrying the burden of blame rather than mismanagement by men. There can no doubt be an expansion of effort backed by credit that seems sound at the time but which later proves to be a boomerang. The stage may be well set for such a development.

It can arise through a pyramiding of demand for goods long deferred by the inroads of depression from which we have not yet emerged. Such demand is real and vital but its simultaneous claim upon all industry may call for volume far above normal and tax capacity to the point of overextension. When such demand—abnormal merely because it is bunched up—is satisfied, it must recede with resulting retrenchment, unemployment and unpaid obligations. The fault lies not with the credit base nor with gold, but with the prior causes of the deferred demand and our failure to recognize the symptoms. We should not expect credit to be automatic nor superior in wisdom to its human management.

Call the Navigators

It is time to wake up! The cable has slipped from its golden anchor. The pilots tell us we are living in a new world. They are wrong! The surroundings merely seem new because we have gone badly adrift in the same old world and the pilots know not where. We are so far off the course that we should now put off the pilots and call the navigators who will not be so bewildered by the shoals of today that they have no vision of the rocks of tomorrow. If

(*Continued on page 66*)

SILVER, An Industrial Commodity*

● ***Discussion of silver as a monetary metal obscures the important and increasing part silver plays as a material for industrial use.***

By DR. ALEXANDER GOETZ

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IF a Gallup poll were taken to determine the general opinion as to whether or not silver is—aside from its employment for coinage or its use by the silversmith and jeweler—an industrially important and even indispensable commodity, one can be pretty certain that the vast majority would answer in the negative. Such an outcome would reflect general opinion adequately, but at the same time illustrate that an opinion, no matter how general, must not necessarily be true. Particularly so in the case of silver, where it is an indisputable fact that silver is a commodity as inseparable from our present civilization as are iron, aluminum, tin, zinc, lead, and copper. In fact, the alloys of the latter metals can substitute for each other in very many cases, whereas most of the uses of silver are specific ones, i.e., no other metal can act as an equal substitute although the high price of silver attaches a considerable premium on any replacement of silver by a less expensive substance.

The fact that this almost unique situation has not been recognized generally is due to a number of factors, chiefly economical. For 3,000 to 4,000 years silver has ranked with gold as the measure of monetary value in a ratio to gold which throughout the centuries fluctuated relatively little around the value of 1:14. It is chiefly international economic developments within the last 50 years which caused silver to lose gradually its ranking as a monetary standard and, in recent times, even that of a "precious" metal, when the gold-silver ratio reached the 1:100 mark. To what extent these developments are caused by the unnatural gold distribution throughout the world and whether or not this situation will and even can be other than temporary is not within the scope of this paper. Still one rather absurd aspect of this problem may be mentioned, for it has a definite bearing upon the future valuation of silver: The general acceptance of the choice of gold and silver as monetary standards was due to considerations of political and economic character and was and still is quite independent of the technological importance of these metals for our civilization. This is well illustrated by the example of the similarly important and precious metals of the platinum group (palladium, platinum, rhodium, iridium, osmium) which never reached the rank of monetary standards, in spite of their scarcity and resistance to corrosion, which qualities are said to be the prerequisite for a monetary medium of exchange. Strange as it sounds, in competition with gold, silver has lost its "value" the more its practical usefulness was recognized, and neither the rather modest increase of silver production nor a dependence of the industrial demand for silver on its price can serve to explain this paradox. Similarly our present times prove that one can withdraw gold rather completely without seriously handicapping industrial production; if one would, however, put all silver into storage it would prove to be a serious handicap to the civilized world. A brief analysis of the peculiar properties of silver will show that in contradistinction to gold the former is a truly indispensable commodity of very diversified usefulness.

The practical applicability of a metal is determined by its fundamental physical and chemical properties and the combination of such properties typical for each metal, hence may follow a brief account of them.

Silver Best Conducting Material

Generally speaking it is interesting to note that among the 92 elements (of which 75 are of metallic character) silver is the metallic element which occupies the center of the Periodic System, being equally remote from the lightest (hydrogen) and the heaviest (uranium) atom. Due to this unique position silver combines many properties of the lighter metals with those of the heavier. Certain consequences of this position (caused by the peculiar atomic structure of silver) render silver the best known conducting material for heat and electricity, and a perfectly polished silver surface the most efficient reflector of light over the visible range of the spectrum. Silver thus appears to be ideal for the transportation of electricity and the transfer of heat energy on large scales. In both cases, however, the metal is practically unemployable, partly for economic reasons because the saving of energy does not justify the considerable increase in capital investment caused by the employment of silver against baser metals.

Aside from this economical consideration the mechanical weakness of pure silver prohibits its use for power lines, transformers and motors unless a practicable way of reenforcing it by proper mechanical support can be de-

* Presented in part at the Annual Mining Convention, Western Division, the American Mining Congress, Colorado Springs, Colo., September 16-19, 1940.

† In 1937, the Rare Metals Institute was founded at the California Institute of Technology in Pasadena, with the support and under the sponsorship of the Sunshine Mining Company. The purpose of the Rare Metals Institute is the analysis and investigation of the industrial uses and applicability of rare metals, in particular of silver, furthermore, the development of new uses of the metal. The material presented in the following is drawn chiefly from these developments during the last three years. To some extent it is also based upon results obtained by the American Silver Producers' Research Project, which, from 1935 to 1939 carried on research work along similar lines with the collaboration of the National Bureau of Standards.

veloped, because the hardening of silver by alloying it with other well conducting metals is unfeasible, even minute additions destroying the good conductive qualities.

Excellent for Electrical Contacts

There exists, nevertheless, an important use of silver in the electric industries for *contacts* of the stationary as well as of the moving type. Contrary to general opinion it is not the high electric conductivity of silver which causes the superiority of the metal over copper for this purpose, for the chief problem is here the *contact resistance* which is determined by the nature of the corrosion products at the contacting surfaces. Under normal conditions silver corrodes to silver sulphide (Ag_2S) whereas copper surfaces become coated with cuprous oxide (Cu_2O). The latter is practically an insulator, whereas silver sulphide is a fairly good conductor (approximately 1,000,000 times better than cuprous oxide). Hence the contact losses on silver due to corrosion are considerably decreased on account of the chemical properties of the silver surface.

For stationary contacts the metal is either bonded to steel or copper, or alloyed, depending upon the conditions of operation, with metals such as copper, zinc, platinum, molybdenum and tungsten. For contacts of the moving type (generator and motor brushes) silver has, in addition to the aforementioned advantages, smaller frictional losses than the normal carbon or copper-carbon brushes. It is used here as a compound with graphite and although the development of this particular use of silver is far from complete, the advantages appear to justify the expectancy of the increasing use of the metal for such purposes. Fig. 1 may serve to illustrate the advantages of silver contact surfaces against those of copper.

Other Uses Based on Reflectivity

The other outstanding physical quality is the reflectivity for light from the violet to the far infrared region of the spectrum.

Its utilization for the backing of mirrors and thermos bottles (where its excellent reflectivity for infrared is important) is world-wide and ancient. It is greatly assisted by the ease with which brilliant coats of silver can be produced by the chemical reduction of its salts.

This supreme reflectivity is also the cause of the esthetic value of its lustre

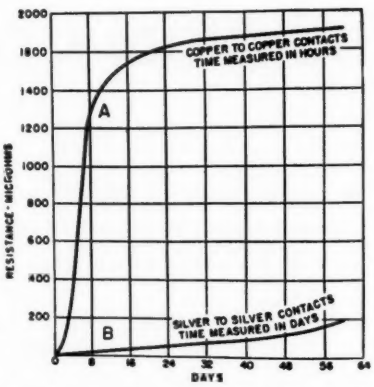

Fig. 1. Change of contact resistance with time for copper-to-copper (time scale in hours) and for silver-silver (time scale in days) at a temperature of 85° C. (From L. Zickrick in "Silver in Industry")*

and its desirability as material for *tableware* and *artifacts*, greatly assisted by the plasticity of the metal. This application in particular suffers a severe handicap from the affinity of silver for sulphur which results in the tendency to tarnish. The widespread use of the metal in practically every household renders the protection of polished silver surfaces against tarnish an old problem of considerable importance. Nevertheless, it has not yet found a satisfactory solution, mainly because the conditions of shielding the metal against sulphur while not affecting its lustre, in other words, of preserving the optical qualities while changing the chemical nature of the metal surface, are contradictory and mutually exclusive. Many methods of surface protection have been elaborated, such as transparent lacquers and electrolytic passivation (invisible anodic deposits) which provide for temporary protection or electroplating with metals resistant to sulphur and oxidation such as rhodium, for example. These methods affect the lustre for reasons similar to those which cause tarnish-protective admixtures (cadmium, indium, beryllium, silicon, etc.) alloyed to silver to impair the appearance of the metal. In spite of the commercial importance of such uses of silver the application of the metal by the silversmith is similar to its use for coinage: it depends upon economic and social conditions and should hardly be classified with industrial uses in the strictest sense. In fact, the total volume of silver employed for such purposes appears to approach saturation throughout the world, consequently the employment of new silver in the production of silverware has gradually grown smaller.

Metallurgical Applications of Silver

The reverse is true for the *metallurgical applications* of silver where continuously new and more diversified uses are found which promise more than ample compensation for the decreasing use by the silversmith. These applications, i.e., the addition of silver to other metals as an alloy, center chiefly around its alloyability with most of the non-ferrous metals. This "promiscuity" is chiefly responsible for rendering silver and silver alloys the most desirable and durable high temperature *soldering and brazing material* of exceptional strength, durability and resistance against corrosion. Hence silver serves as the main ingredient to the alloys used as "hard" solders, such as copper and zinc with melting points between 1,300°-1,700° F. In particular a new type of silver-containing lead solder has been recently developed with a silver content varying between 2.5 percent and 5 percent which fills the existing gap of melting points between the lead-tin (soft) and silver-copper (hard) solders.

Silver alloys with the metals of the platinum group, in particular with palladium and small additions of gold, form a most interesting and promising material which is extremely corrosion-resistant, possesses mechanical strength, can be cast and in addition be hardened by heat treatment. Consequently such alloys have found wide use in *dental work, fountain pens*, etc., where they approach the chemical passivity of gold, the mechanical qualities of steel and approximately one-fifth of the price of gold.

Whereas the scarcity of gold may have been a stimulus for the development and the wide use of such alloys in Europe, the application of amalgamated silver, i.e., silver-mercury-tin alloys, for *dental fillings* is world-wide, for such combinations have the peculiar property of being highly formable at first and "setting" to a hard mass in a relatively short time after application.

The addition of silver to *magnesium and aluminum alloys* is claimed to increase their formability considerably. Silver-containing (up to 7 percent) light metal alloys lend themselves better to the processes of forging, pressing, spinning, etc., without decrease of mechanical strength. This is important for the construction of aircraft, although reported tendencies of such alloys to corrosion may restrict the use of silver in this field.

Another metallurgical characteristic of silver is its complete lack of a ten-

* Courtesy of Reinhold Publishing Company, New York City.

dency to combine with unalloyed steels. This property combined with the large heat conductivity and high plasticity of silver has led to its application as *bearing material* in place of babbitt metal. The danger of seizure between bearing and rotating journal can be considerably decreased, the frictional losses are smaller, and the heat created is carried away much faster, lowering thus the temperature of the bearing and adding to its lifetime. Although the experience in this field is far from being complete, a considerable development of its application particularly in the automotive and airplane industry has already taken place and even more importance can be anticipated in the future.

The addition of the metal in small concentrations to the *stainless steels* has proven to increase the resistivity of the steels against attacks by brine and seawater. This particular protection is thought to be due to the fact that the silver, which is distributed in the grain as well as the grain boundaries within the metal, turns when in touch with corrosive chlorides, into the practically insoluble silver chloride which in turn serves as a "self-healing" protective coat over regions attacked by corrosion. The importance of this application may be considerable in view of the desirability of the use of stainless steels for marine purposes.

With Lead in Storage Batteries

The use of small additions of silver to the lead of carriers of the active masses in *storage batteries* acts similarly as a protective against corrosion and increases the lifetime of the battery.

There are many more metallurgical applications of silver which—though interesting from a scientific point of view—have still to be considered irrelevant.

Silver is a Corrosion Protective

It can be easily realized that the technological importance of silver in the majority of the applications mentioned so far lies more in its chemical than in its physical character. The most desirable qualities of the former type render silver a remarkable *corrosion protective*, for the metal combines two properties to a very large degree which are prerequisites for protection against chemical attack: It does not react appreciably either with most alkaline substances or with most acids and, if it is attacked, the corrosion products are mostly insoluble and tend to form protective coats. These qualities have led already early to the use of the metal as lining of vats, pipes, etc., in the chemical industry. Pertaining to this point a few of the most important corrosive substances used in industry may be mentioned against which silver is a perfect or at least an adequate protection: Acetic acid and most acetates (rayon industry), aqua regia, hydrofluoric acid, organic acids, the halogens, alkali hydroxydes, anilin (dye industry), formaldehyde, ink, dyestuffs, phenol, essential oils, practically all beverages and foods.

For some of these purposes silver is obviously in competition with the corrosion resistant nickel alloys and stainless steels. The drawback of its cost is, though, for many applications balanced by the fact that silver can be easily bonded to a baser supporting metal. Only a minor quantity of the metal is required and, furthermore, it can always be recovered to a large extent.

Important Use of Silver May be in Can Linings

In particular favor of silver is the absence of color, taste and toxicity of its reaction products—if any—with food stuffs and beverages. In fact, it forms the ideal container for such materials. Systematic efforts by the American Silver Producers' Research Project have shown in recent years the commercial possibility of *lining non-returnable cans* with a pore-free silver coat upon copper plated steel down to 10 millionths of an inch (0.00001") thickness, involving a material expense of 0.28 cents per square foot (at a silver price of 35 cents per ounce) or $1.60 net per thousand, for the usual quart size cans. One hundred million quart cans per annum would absorb thus 4-5 million ounces of silver, or 1/5 of the total silver consumption in this country. The chief technical problem consists here in developing plating methods which provide for a thin coat which is absolutely pore-free, and in an economical production of rolled steel of sufficient uniformity and surface perfection to facilitate such extremely thin electrolytic silver deposits of complete coherence; also the relative delicacy of the electrolytic process on a large scale may involve commercial difficulties which have to be overcome as soon as the advantages, at least for high quality foods, are fully recognized. It may also appear that the process of depositing the metal by evaporation upon the inner surface of *varnished* cans is, for numerous technical reasons, more advisable. In this case the plastic is the protector for the steel whereas the silver coat on the plastic serves as a protector of the resin against chemical attack by the food material. In view of our national dependence on import of tin it is needless to emphasize either the importance of this possibility for the replacement of tin by silver and silver plastic coats in the canning industry or the stimulus which industrial demand would effect upon the domestic silver production.

Large Quantities of Silver Consumed in Photographic Supplies

The analysis of the technical usefulness of silver has shown so far that chiefly the chemical nature is the main point of its value. But although the chemistry of silver is fairly well known, two of the metal's most unique qualities have not yet found a satisfactory scientific interpretation. One has been known for exactly 101 years, the other is a discovery of recent date; the former has led to the largest industrial application of the metal, the other may lead to a still larger one.

A century ago the French painter Daguerre found accidentally that silver when exposed to light for a short time, keeps a sort of a "memory" of this incident, since, when subsequently undergoing a certain chemical process, the regions struck by light assume a visibly different appearance from those not exposed. This is known as the *photographic process* and the "memory" as the "latent image." The subsequent various developments have not changed any fundamentals but have rendered the utilization of the process so widespread that it can safely be said that there is now practically no pictorial representation on paper for which a photochemical process has not been employed at one stage or another of its production. As *only silver*, in form of its halides (chiefly the chloride and bromide), can serve for this process, it is no exaggeration to state that this metal is for this purpose truly indispensable to civilization.

The importance of this industrial application is well reflected in the fact that the annual world silver consumption has proven to be independent of the silver price. Its size can safely be estimated to amount to from 300 to 400 metric tons of the metal (circa 10 to 13 million ounces), and approaches the consumption in the silverware industry and even the demand of the metal for coinage. Although reliable data are difficult to obtain, it

appears safe to assume that the 12 million ounces consumed in this country (1938) for the production of silver nitrate go chiefly to the photographic industries in America which produces probably one-half of the photographic products of the world.

From the standpoint of the silver producer there are two important developments which tend to decrease in the future the use of new silver for this purpose: On the one hand relatively inexpensive methods for the recovery of the silver not used in the final product have been developed, on the other hand, the increasing development and popularity of color photography. Although silver is as indispensable in this art as in black-and-white photography, it is replaced in the finishing process by dyes, thus the final picture does not contain silver. Since the processing is done in large plants, the almost complete recovery of the silver originally employed is simple and tends to form a stock of photo-catalytic silver owned by the film producer, which is only "leased" to the photographer with the sale of the film. Of course this situation is not important at present, but with the anticipated development of color photography it may become so in the future.

Germicidal Power of Silver

Finally a property of silver shall be discussed which appears to bear a great promise in the future; that is, its *effect upon the living organism.* Generally speaking silver shares with most other heavy metals like mercury, copper, lead, etc., the quality of being a very severe poison to the living cell. Most of the metals are also severely toxic to humans and animals, whereas (with the possible exception of gold), silver is probably the least harmful to the warm-blooded organism. Although the consequences of silver poisoning—argyria and argyrosis—represent considerable injuries, they are practically never deadly; in any case, the quantities required to cause argyria are by far larger than those necessary with the other metals mentioned. On the other hand, it has been found that silver (in its ionic form) is so deadly to micro-organisms like bacteria, yeasts, etc., that under certain circumstances even *one single ion* can destroy a yeast cell, whereas the lethal ion concentration for metals like gold, mercury and copper is 100-1,000 million times larger. It would, however, be misleading to draw from this the conclusion that silver is generally a billion times more bactericidal, for in the practical application of silver as a germicide many factors enter all of which have the tendency to decrease the efficiency and which, on account of their complexity, are not yet thoroughly understood.

The germicidal power of silver is easily demonstrated as shown in Fig. 2: A neutral carrier (carbon) containing very small quantities of finely divided silver is placed in a plate of nutrient agar which is subsequently heavily infected with bacteria. After the proper incubation time the opacity of the plate indicates regions of bacterial growth whereas transparent domains ("halos") characterize regions in which no growth occurred. The limits of the sterile zones are due to gradual absorption of the silver ions within the solid agar.

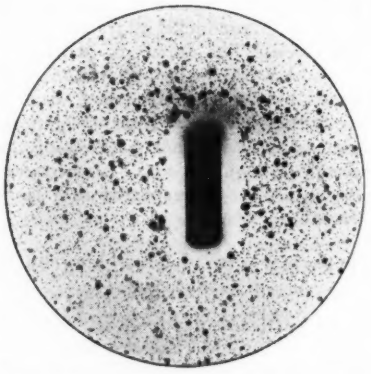

Fig. 2. Photograph (.5 actual size) of source of silver ions inserted into agar plate with heavy bacterial growth. The "halo" around the source represents the sterile zone produced by silver ions. (Author)

This localization of the sterilizing power is obviously absent in water where careful experiments have shown that a silver concentration of one part in 10-20 million renders it safe for human consumption even if the water was heavily infected. This compares with chlorine within a factor of 3-5 in favor of silver.

Another not less important factor which determines the value of a disinfectant is the margin between germicidally effective and toxic concentration, and the margin between the former and the concentration at which objectionable taste or odor occurs. The safety margin for silver in water is about 50 times larger than for chlorine.* Silver solutions are always *odorless* and *tasteless* up to concentrations of 1 part in 20,000, whereas chlorine treated water already becomes objectionable at 1:500,000 giving silver an advantage in this respect of at least a factor of 25. Similar to chlorine the sterilizing efficiency of silver is considerably reduced by the presence of organic colloids in the water, and furthermore by the presence of an excess of sulphur.

In view of the lack of practical development in this country of large scale water sanitation with silver, it is difficult to arrive at a comparative estimate of the expenses involved. It can, however, be safely anticipated that cost of the silver will be small and probably quite negligible in comparison with the general expenses involved with the operation of sanitation plants. According to the above figures one ounce of silver should suffice for the treatment of 100,000-200,000 gallons of clear water, in other words, the material (without the operational) expense for the treatment of one million gallons of such water would at the present silver price amount to only $2 to $4.

All applications of silver as germicide require the introduction of silver ions into the liquid to be treated. This can be accomplished in numerous ways, for instance by electrolysis (Katadyn and Matzka Process) or by the insertion of neutral carriers into the liquid which emit ions at the rate and for a time required. The choice of the methods for maximum efficiency depends largely upon the conditions in each case.

The operation of two rather interesting methods may be indicated: In one process (Katadyn, Fig. 3) the water flows between a pair or a labyrinth (depending on the size of the plant) of silver electrodes, kept at a voltage difference of about 1.5 volt by a direct current source. The water flow carries silver ions along from the anode, resulting thus in a germicidal effect.

A different process uses neutral carriers, such as small carbon pellets containing minute amounts of finely distributed silver activated in certain ways. These pellets give off germicidal silver as they come in contact with water. They are particularly applicable for the sanitation of portable water supplies, such as small tanks, canteens, etc.

The advantages of such methods of sanitation and sterilization with silver have been realized in the past decade

* If, according to recently published data, the dosis of silver necessary to produce the first indications of argyria is conservatively taken as 50 grams dissolved in one liter, it represents a concentration of 1:200. The ratio between the germicidal active and toxic concentrations is thus 100,000. For chlorine a severe toxic effect is reached at concentrations of 1:1000 allowing to silver a 50 fold superior safety, or probably better.

in Europe to a much larger extent than in this country, and have led there to the developments of plants for the treatment of water supplies, sanitation of swimming pools, and water sterilization in the wine, beer, vinegar and soft drink industries. It should be expected that similar developments will take place in this country. It may also be mentioned that these uses of silver make a recovery of the metal impracticable in most cases.

Minor Uses

Somewhat different from such applications is the economic feasibility of the use of silver as an *agricultural fungicide*, where it would be very useful but where it has to meet the competition with copper.

Well known, but contributing less than 1 percent to the total silver consumption, are the numerous uses in the *pharmaceutic industry* where silver is used chiefly as organo-colloid or as nitrate.

Aside from most of the minor uses, there still remain two possibilities for specific applications of silver which warrant some interest, though they appear impractical at present: Silver has the unique property of absorbing 20-21 times its volume of

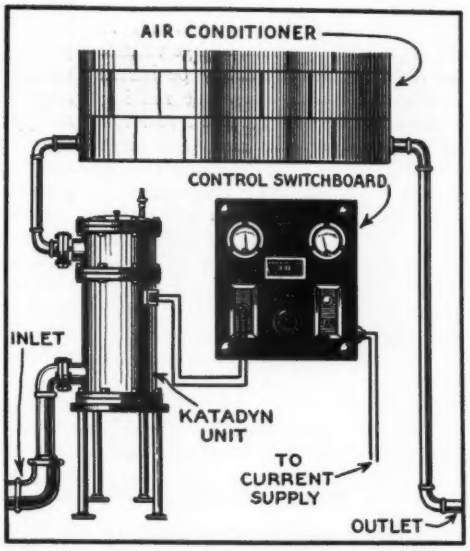

Fig. 3. Arrangement of plant for water sanitation by the electrolytic introduction of silver into the water. (Courtesy of Katadyn Corporation)

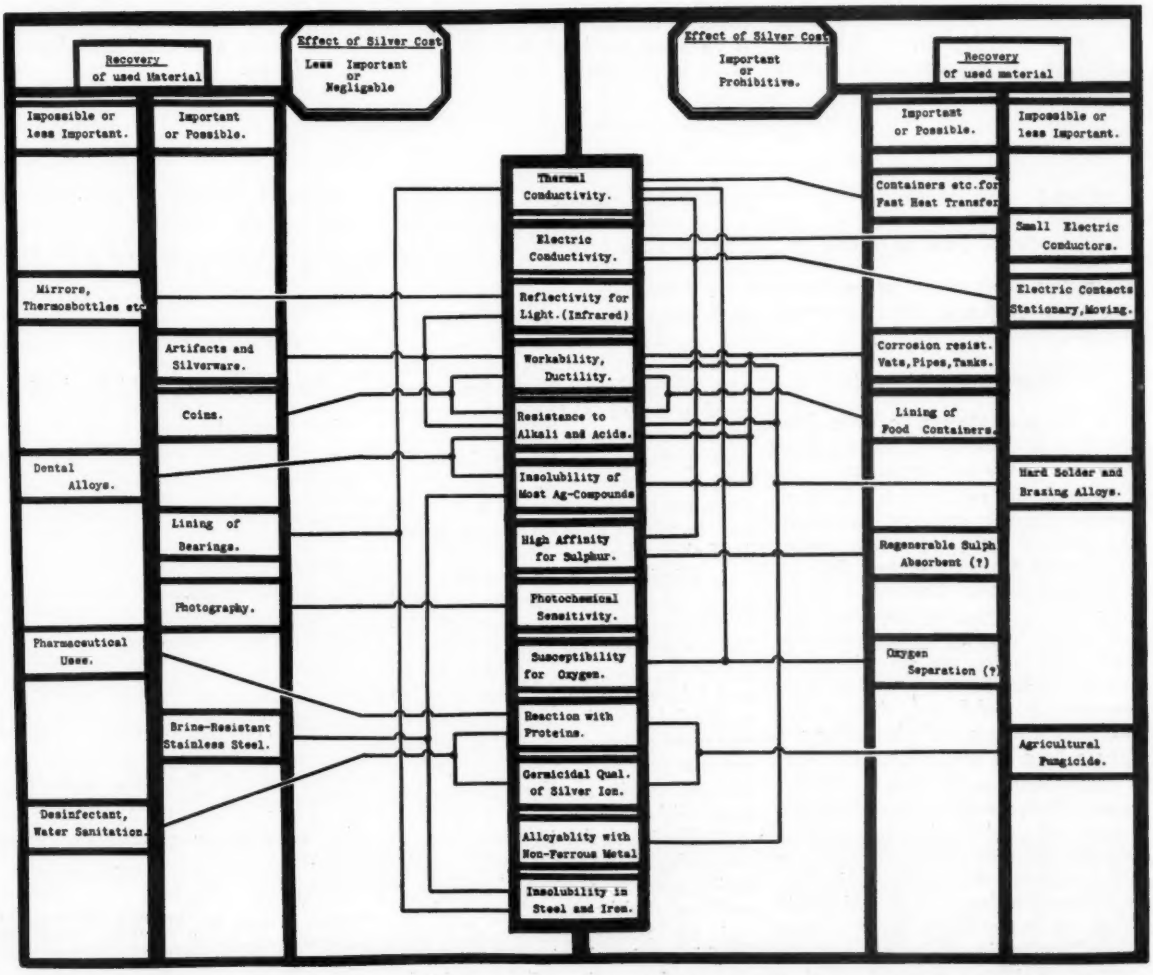

Fig. 4. Schematic "birds-eye-view" of the relations of the main industrial uses of silver to its technological qualities and to certain economic factors

oxygen in the molten state and of giving it off when becoming a solid. A cyclic process by which a large volume of silver would alternately be heated above and cooled below the melting point could be used for the *separation of oxygen* from the air. The large thermal conductivity of silver should permit a considerable "turn-over."

Second, the well-known affinity of silver for sulphur renders the metal in a finely distributed state an excellent specific absorbent for free and bound sulphur in liquids (e.g. crude oils) and gases. The initial expense of the amount of silver is in part balanced by the fact that the resulting sulphide is easily reduced, regenerating the silver, and that the sulphur thus eliminated can be reclaimed.

Silver Diversely Employed

Although the above cannot make any claims to be a complete treatise on the subject, it may be sufficient to prove that silver is probably the metal of the most highly diverse industrial usefulness. It surpasses in this respect even iron, aluminum and copper and most certainly its high-priced cousin—gold. This diversity is due to the large number of practically important qualities. This fact distinguishes the technology of silver from most other metals and renders it particularly interesting and still attractive to the pioneer.

In order to present once more the applications of silver and their dependence on its physical, chemical, and metallurgical qualities and their relationship to economic factors, such as the silver price and the recovery of the metal, the schematic bird's-eye view—Fig. 4—was constructed. The important qualities of silver are enumerated along the center line; the different applications of the metal and its compounds are given right and left of the center, the connecting lines indicate the particular property or combination of properties upon which each application is based. On the left are shown applications which are either so important or in which silver is so small an item that the silver price is practically irrelevant. The opposite is true for uses listed on the right. Not less important is the question of recovery. Hence two columns on both sides divide the applications into two classes: those where recovery is impossible or of minor interest, and those where it is imperative or at least possible to reclaim the metal for repeated use.

Especially in recent years the industrial value of silver has been recognized at an increasing rate and although it will probably never be a commodity of first rank as far as volume is concerned, it will always be a commodity indispensable to a large number of vital industries, and thus the metal will show a consumption steadily increasing with the spread of industrialization over the world. To this country this should be particularly interesting in view of the fact that the United States controls 75 percent of the world silver production.

It may also mean that the future development of the silver valuation will progress along lines entirely different from and unaffected by the fate of gold.

Gold

(*Continued from page* 60)

we do this, there should be no reason to abandon gold nor even to continue juggling with it.

What to Do About It

If the navigators take over, how can they lead us out of the troubled waters and back on the course?

They should realize that gold production today is sufficient to supply the needs of the world if it can only be diverted from its present flow to the United States. This could not be immediate nor can we stop the present stream coming in payment for war goods unless we are willing to extend credit in lieu of cash payment—a doubtful procedure under the circumstances. Undoubtedly we have a bear by the tail on this one.

They should realize that one of the most effective ways of curtailing the amount of gold coming to us, is to improve our domestic economy to the point that we shall again be buying our normal volume of needed goods from the rest of the world. We are not self-sustaining.

They should furthermore know that this domestic improvement will not come in full measure without a restoration of confidence in our government and the future. To do this we must:

1. Restore the control of our monetary policies to Congress where they are placed by the Constitution.
2. Restore the convertibility of the paper dollar into gold at the present fixed price of $35 per fine ounce, thereby eliminating the fear of future price juggling and freeing funds for long-term investment. When this is done, the people who pay for the gold and to whom it belongs may possess it if they wish.
3. Eliminate the bureaucratic barnacles that have recently attached themselves to the ship of state. Unless we can cut the reckless and unnecessary government expenditures and balance the budget, the towering national debt will wreck our monetary structure more completely than any external development with gold. The dangers within are far greater than those without.
4. Eliminate the inconsistencies in economic, financial and social policies which neutralize results but hang a necklace of debt around our necks.
5. And finally and above all restore confidence in the integrity of our country by casting off legalistic devices and class cleavage and making common honesty once more an attribute of the nation.

If these things are done we may look forward with hope. If not, let each man look to his own preservation.

California Leads in Gold Production; Idaho in Silver

California again led the nation in gold output during 1940. The leading gold producing states with comparison of 1940 and 1939 output follows:

State	Value in 1940	1939
California	$49,304,500	$50,234,240
Alaska	25,952,000	23,275,000
South Dakota	20,752,760	21,648,760
Colorado	12,907,930	12,839,820
Nevada	12,859,000	12,653,130
Utah	12,346,950	9,721,285
Arizona	10,237,500	11,075,855
Montana	9,649,500	9,246,055
Idaho	5,075,000	4,083,170

Idaho was the leading silver producing state in the year. The silver production of the leading western states with comparable figures of 1940 and 1939 silver production is as follows:

State	Value in 1940	1939
Idaho	$12,256,000	$11,690,336
Montana	8,878,200	6,168,533
Utah	8,722,587	7,302,846
Colorado	6,789,053	5,767,313
Arizona	4,940,000	5,310,839
Nevada	3,630,222	2,929,668

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This 2½ ton gear, although broken in several places, was back on the job only six days after it failed

This gear looked something like Humpty-Dumpty... it was so severely broken that it looked almost impossible to repair. But, here, as in many other emergencies, Tobin Bronze repair welding performed the "impossible," in the shortest possible time.

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The Hebeler Welding Co., Buffalo, N. Y., repair-welded this 2½ ton gear in 64 man hours with 250 lbs. of Tobin Bronze. 40123

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AN INFORMAL DISCUSSION ON COST KEEPING—

By G. B. SOUTHWARD
Mining Engineer
American Mining Congress

MULTIPLICITY of cost items seems to be a characteristic of coal mine accounting. The practice among many coal companies is to divide and subdivide the major cost classifications to the point where the monthly statement frequently becomes quite formidable in appearance and evidently must require a great deal of time for its preparation. This procedure may be the result of established custom or it may be of recent origin, but in either case, I wonder whether so much detailed breakdown in the operating items is really worthwhile.

The man that has direct control over the operating cost is the plant superintendent and it is a pretty safe bet that an amount so small as to be expressed in fractions of a cent does not give him any real concern. He has many larger affairs to look after. But if he doesn't use these subdivided cost figures, who does? Of course I don't know for sure, but my guess would be—nobody. Such a statement may be regarded as heresy in some quarters, but this is a free country and it is my own opinion. If it's wrong, I want to be corrected and will pass the word along to the committees on mechanical loading and conveyor mining, who are making studies on cost keeping systems for mechanized operations.

Two preliminary reports on this subject have been prepared—one on mechanical loading, which was published in the January number of MINING CONGRESS JOURNAL, and one on conveyor mining, which is given on the following pages of this issue. These are well worth the attention of coal operating men because they express the views of the operating management, rather than those of the executive or the accountant.

As these preliminary reports explain, the committees have not yet reached the point of making definite recommendations. I do not know what their final report will say. However, discussions in the meetings indicate that one conclusion has definitely crystallized in the minds of the members themselves; that is, the desirability of simplifying cost forms and reducing the number of items to such sub-classifications as are really useful in keeping a check on the operation. To go further than this seems to be regarded as an unnecessary refinement and, instead of being helpful, complicates the cost statement to the point where it is difficult to grasp. If a detailed breakdown is desired on any particular operation, a time study or engineering analysis should be made.

Another question comes up: How accurate are these sub-classifications? In order to find the answer to this, we have to go back to the beginning of all cost statements, which is the daily time book kept by the foremen. We know that the total amount of labor is correctly reported—the men see to that, but just how accurately this daily time is distributed between the different classes of work done, is a question which each mine operator will have to answer for himself. Speaking for the committee, if a figure is merely an approximation, why bother to show it; in other words, why measure to the nearest foot and then calculate to a fraction of an inch?

An examination of the monthly statements used by companies operating conveyors and mechanical loaders, shows a wide variance in the cost keeping systems. The committee reports have already mentioned that fact, but I want to give an illustration. We have here two forms—one has more than 100 different labor classifications from the face through the tipple, while the other contains only 14 items of labor for all operations of mining and preparation. An interesting thing about these two particular sheets is that the companies using them have the same general type of mechanical loading, and approximately the same mining conditions. Evidently the bookkeeping system is not altogether determined by equipment and conditions but is also a matter of personal choice which in turn indicates that there may be a selling job to do in recommending uniform cost procedure.

Since personal choice in these matters seems to be the rule why should the committee go to the trouble of trying to standardize the methods? These committees are composed of men who have spent quite a few years in developing mechanized mining and, in the course of their experience, they have learned a great deal from each other. They have found that, in order to exchange ideas, all must speak the same language, and in comparing one mining method with another their costs must be calculated on the same basis and include the same items.

There is also another reason. The purpose of the Coal Division is to bring to the industry accounts of the newest developments and the best manner of performing the different operations of mining. Time studies, daily records, inspection reports and cost sheets are necessary tools for gauging the performance efficiency, and the committee is therefore interested in perfecting these tools to be of the greatest practicable use.

SEMI-MONTHLY COST STATEMENTS FOR CONVEYOR MINING

● *Preliminary Report by the Conveyor Committee*

THE Committee on Conveyor Mining is making a study, similar to that by the Mechanical Loading Committee, on the subject of cost keeping methods. Both committees have experienced difficulties in attempting to develop uniform cost keeping practices from the many different methods now in use. However, the very fact that differences exist shows that there is a real need for coordination.

Purpose of Periodic Statements

Recommended forms for Conveyor Daily Reports were completed some time ago, and the committee has now gone on to the next step and is studying the question of periodic or intermediate cost statements—which are made at weekly, semi-monthly, or 10-day intervals. The periodic figures are not as complete or accurate as the final monthly statements, but are designed to furnish condensed information on costs and performances that will keep the operating management in close touch with current results. By this means any unfavorable trend can be corrected almost immediately.

Before any final report is made on this subject the committee plans to study the cost systems of a number of coal companies, and has started this study by preparing three preliminary reports, which are presented with this article. These are not intended to be final recommendations, nor necessarily any recommendations at all, but simply illustrate some of the various ways in which conveyor costs are now being kept. A comparison and analysis of the methods used at representative conveyor mining operations will determine what general or specific suggestions the committee should make.

The three forms submitted here are entitled Semi-Monthly Statements, but the term "semi-monthly" is understood to mean an intermediate report during the month at whatever interval is considered most desirable. These forms are illustrative and are not exact duplicates of actual sheets used by operating companies.

Figure 1

Figure 1 is submitted by T. F. McCarthy, with the following comment and explanation:

"Due to the diversity of conveyorized mining systems and the different methods of payment of the crews operating such equipment, it would be difficult to develop any system of 'Conveyor Cost Keeping' that will serve as a standard for the industry or meet the needs of the individual operating official. However every operating official is, and should be, interested in securing an accurate breakdown of costs and requires correct information to check on the efficiency of his equipment.

"In our mines operating in thin seams, where rock brushing is required in entries for travel height; where complete extraction of coal is practiced and a certain amount of hand loading into mine cars is used; our methods of cost and production records may differ widely from operations carried on under different conditions.

"Most of our conveyor loading is performed under a tonnage contract rate that covers a definite limitation in the work included in this contract price. We are, therefore, interested in the production of the individual worker and the extra payments to him above the contract price and in the extra cost of servicing and moving this equipment. High individual earnings of conveyor crews make for more contented workmen and as a

	Number of Man Days	Tons per man day	COMPANY WORK OR CONTRACT COST											SUPPLIES				TRIMMINGS		
			Daily Tons	Coal Cost	Yardage	Allowances	Rock	Moving & Setting Machine	Main	Preparing Place Rock	Pull or Set Timber	Water	Total Daily Cost	Explosives	Oil	Timber	Mining Machine Conveyor Supplies	Coal	Rock	Delay
Sub-Total																				

Labor Cost-Company Men	
Total Cost	
Cost Per Ton	
Cost Per Yard	
Tons per man day	
Earnings per man	

Fig. 1. Semi-monthly cost statement for conveyor mining

result we watch individual production and earnings very carefully.

"As a result of our conditions, our detailed records of conveyor costs cover all cost items of conveyor loaded coal into the mine car and from established standards we can determine when units are out of line. When the contract method of payment is used, the real index to efficiency is the production of the conveyor crew. The controllable items of cost, such as allowances, moving and maintenance, while not large in proportion to the contract rate, are important items of cost and must be watched if best results are to be secured.

"In our conveyorized mining, each installation, whether it be composed of a single unit loading directly into mine cars or a multiple installation of from two to eight conveyors loading into a gathering conveyor, is considered as a unit and all items of cost and production are kept on each of these unit installations.

"Figure 1 is a 'Semi-Monthly Conveyor Report' that can be used to record daily and semi-monthly cost and production data on each individual installation or this form can be used to secure this information in a summarized form on all unit installations in one mine. Unless it is wished to make a study of the daily cost and production from an individual installation, the summarized data are compiled from the daily reports of conveyor crews and daily reports of regular maintenance men.

"The items listed are self-explanatory. All items above the horizontal line showing the Sub-Totals, cover payments made to conveyor crews and production of each unit installation. Under Labor Cost—Company Men is listed all items of cost paid to other than conveyor crews and these items of cost are prorated over all installations."

OPERATION	CONVR. CREWS Amt.	CONVR. CREWS Per Ton	DAYMEN Amt.	DAYMEN Per Ton	MATERIAL Amt.	MATERIAL Per Ton	TOTAL Amt.	TOTAL Per Ton
1. Tons at								
2. Tons at								
3. Conveyor Crew Bonus								
4. Moving Equipment								
5. Extra Allowances								
6. Timbering								
7. Preparing New Places								
MAINTENANCE								
8. Conveyors								
9. Car Pullers								
10. Cutting Machines								
11. Lubrication								
12. Inspection								
13. Miscellaneous								
HAULAGE								
14. Gathering Conveyor								
15. Car Moving								
16. TOTAL COST								
17. Tonnage Produced								
18. Shifts Worked								
19. Average Tons per Shift								
20. Man Shifts Worked								
21. Tons per Man Shift								
22. Conveyor Crew Earnings								

Fig. 2

Item 6. Timbering that is not included in contract rate
Item 14-15. Omitted if gathering conveyor is operated by contract conveyor crew
Item 20-21. Applies only to regular conveyor crew
Item 22. Average earnings per man shift by regular conveyor crew

Figure 2

Figure 2 is submitted jointly by R. G. Pfahler and W. C. Fancourt, and is accompanied by the following explanation:

"Preliminary meetings of various members of the committee have developed a great diversity of views on what should be included in a Conveyor Cost Statement. Considering the numerous conveyor mining systems in use in Central Pennsylvania only and the various interests of the persons to whom such a statement would be of value, this is not surprising.

UNIT NUMBER	No. Faces in Unit	SHIFT AVERAGES: No. Cuts Loaded	Tons Coal Loaded	Cars Rock Loaded	Men on Face Crews	Tons Per Man	LABOR COST PER TON: Face Crews	Extra Labor	Super-vision	Total Labor	SUPPLY COST PER TON: Explo-sives	Timber	Other Mat'l	Total Supply	Labor and Supply Cost Per Ton	Average Daily Earning Per Loader
TOTAL																

Fig. 3. Semi-monthly cost statement for conveyor mining

"It is the opinion of the writers that the scope of a Conveyor Cost Statement, to be recommended at this time, should be strictly limited to meeting the requirements of the supervising personnel directly responsible to the management. The management, while vitally interested, must rely upon the supervising force for results, lest sight of the woods be lost in looking for trees.

"The official having supervision of conveyor mining requires various instruments for effective control and the lack of these, will undoubtedly result in inefficiency. Too much stress cannot be placed upon the Daily Operating Conveyor Reports which have already received the attention of this committee. These daily reports make it possible for the superintendent to correct immediately any bad situations and should enable him to instruct the foremen what to anticipate in order to forestall delays or costly errors.

"However, there is some period for which a summary or review of the actual cost of conveyor operation is desirable. The writers are of the opinion that in view of the many changes in conditions that tend to cause extreme fluctuations in daily costs, a daily cost is meaningless. A weekly report would have considerable merit but would be difficult to coordinate with the monthly cost statements. A fair compromise therefore seems to be a semi-monthly statement which can be prepared in conjunction with the pay roll without materially increasing clerical expense.

"The form of cost statement, submitted in Figure 2, is for consideration of the committee. It is particularly suitable for such semi-monthly reports, although it can be readily adapted to any period that may be desired. While the writers believe no more items are essential, this belief is based on their experience with simple conveyor systems and it is recognized that other systems may require a more elaborate treatment. The statement is supposed to be for a completely integrated single or multiple unit; a separate report should be prepared for each such unit, with a summary for all units at a mine.

"The recommended form covers the situation where conveyor crews are paid on a contract basis. Considerable modification might be required if conveyor crews were paid on a day basis. It is, therefore, desirable for members of the committee, operating in districts where conveyor crews are paid on an hourly basis, to submit a report which would meet conditions in such districts."

Figure 3

The form shown in Figure 3 is adapted from a recommendation which was prepared by C. P. Brinton, when the committee was making their study of Daily Reports, and was suggested as a periodic compilation of the information shown on the daily forms. Strictly speaking, therefore, Figure 3 was designed to be more of an operating summary than a cost statement, but is included here because it illustrates, in general, the same points which are brought out by Figures 1 and 2.

Comparisons

These three cost statements, while appearing to be quite different, are similar in a number of respects, which shows that the men who designed them are thinking along the same lines. These cover operations in the same field, where a conveyor tonnage contract rate prevails, and while the underground systems may be quite different, the general operating practices are much the same.

All these reports, in addition to costs, show some performance data, but No. 3 gives more detail in this respect. All are in agreement in showing two specific items—"Tons per Man Shift," and "Earnings per Man." As explained in the description submitted with report No. 1, these two items are regarded as being the real index of operating efficiency.

Figures 1 and 3 give the cost and performance on each conveyor unit, and the "total" would of course be the combined cost for the system. Figure 2, however, is a consolidated report of all units, and if more detail is required, as explained in the text, similar forms can be prepared for each individual unit.

The cost items for labor are in general agreement, and differentiate between the regular crews and extra labor. Report No. 3 shows all extra labor as a single item, while No. 2 divides this into four classifications (Items 4 to 7). No. 1, however, goes into more detail and separates the extra work into all of its various subdivisions.

The item of haulage, or car moving, is specifically mentioned on only one form—Figure 2. In this district, the general practice is to include the hoist operator as a part of the regular contract crew; however, in the case of multiple units with a long gathering conveyor, the man at the car loading point may be on a day rate, and form No. 2 provides for this contingency.

Each form shows the supply cost—Nos. 1 and 3 divide this into a few main classifications, while No. 2 goes into more detail. Nos. 1 and 3 do not include maintenance and repair labor on the semi-monthly form; in report No. 2 a complete break-down of these items is given.

—Submitted November, 1940. Committee on Conveyor Mining.

Changes in mining methods mean change in cost accounting

43rd Annual Meeting of the American Mining Congress

OFFICERS, members and directors of the American Mining Congress congregated in Washington, D. C., on January 29 for the 43rd annual meeting. Every branch of the mining industry was represented, with conferees from all parts of the United States.

A special feature of the meeting was a tax symposium conducted under the auspices of the Executive Tax Committee, Henry B. Fernald, chairman. The committee held sessions all day January 28 at the Mayflower Hotel, and on January 29 conducted an open forum both forenoon and afternoon on pressing problems of federal taxation. The spirited discussion brought out many features of the Excess Profits Tax law which are of particular concern to mining.

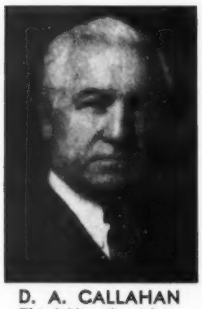
Ellsworth C. Alvord, counsel of the American Mining Congress, talked at length on the general features of this act and the prospects for constructive amendments during the current session of Congress. The chairmen of subcommittees who had studied particular phases of the law, and who reported at the symposium, were: W. H. Peter, controller, M. A. Hanna Company, on the invested capital basis of computing excess profits credit; Herbert C. Jackson, supervisor, Pickands, Mather & Company, on the average earnings basis; and W. K. Daly, controller, Anaconda Copper Mining Company, on consolidated returns. Also discussed were questions of special relief to take care of the many cases wherein abnormalities in base-period income, invested capital, or earnings of the taxable year, would result in marked inequities under the present law. This discussion was so animated that it was also continued the following day, January 30, in the board room of the Mining Congress.

The Resolutions Committee, D. A. Callahan, chairman, met in an all-day session at the Mayflower on January 28 to consider the momentous problems of policy confronting the industry. These discussions were continued and concluded at a breakfast meeting the next morning, following which a declaration of policy was drawn up summarizing the views of the mining industry on present-day issues. The declaration is presented in full on the following pages.

D. D. MOFFAT
First Vice-President

HOWARD I. YOUNG
Reelected President

E. B. GREENE
Second Vice-President



D. A. CALLAHAN
Third Vice-President

At 12:30, following the morning tax session, the annual luncheon and business meeting was held in the Chinese Room. About 100 members, officials and guests were present. Howard I. Young, president, presided and after an excellent luncheon introduced the special guests of the occasion, who were the Honorable Andrew Jackson May, Congressman from the State of Kentucky, Chairman of the House Military Affairs Committee, and Dr. C. K. Leith, Mineral Consultant to the Office of Production Management in Washington. Congressman May was first called upon for a few remarks. He outlined briefly the problems confronting the Congress, the Government and the whole mineral industry in war defense efforts. He also expressed concern for the well-being and prosperity of business and the mineral industries in the period following the present emergency, and issued a warning that we must prepare for the inevitable reaction to follow the feverish activity of the present time.

Dr. Leith spoke briefly and infor-

(*Continued on page 75*)

A DECLARATION OF POLICY

THE AMERICAN MINING CONGRESS, assembled in 43rd Annual Meeting, Washington, D. C., January 29, 1941, declares its views upon the following subjects of public policy:

NATIONAL DEFENSE

The Mining Industry again pledges its full cooperation in National Defense. We urge that:

Appropriate Government agencies furnish to the mining industry full information as to the requirements for each mineral commodity.

Priorities be established only where it is shown that definite shortages exist; and that such priorities be administered in consultation with those responsible for production.

Stock piling of minerals and metals from domestic sources be continued, with the purchase from abroad of such metals and minerals as may be necessary until production in this country can supply the needed quantities.

Special attention be given to the finding and preparing for production of the strategic and critical minerals.

Emergency powers conferred by law upon governmental agencies be automatically terminated when the emergency ceases.

Strongest possible measures be taken for prompt suppression of subversive activities and sabotage.

Facilities created for national defense be treated as part of the military and naval establishments, and provision be made so that such facilities will not be used by Government in competition with private industry for the production of peace time goods.

EMPLOYER-EMPLOYE RELATIONS

Adequate national defense demands increased and uninterrupted productivity.

We believe in collective bargaining. We believe that the proper and sole function of Government in labor disputes is to act as an impartial conciliator, and to hold employers and employes alike responsible before the law for their actions.

We urge amendment of both the National Labor Relations Act and the Fair Labor Standards Act, to relieve the inflexible character of these laws due to blanketing of their provisions over the entire mineral industry, regardless of the conditions surrounding individual operations.

PUBLIC LAND POLICY

We commend the long established system of discovery, location and patent by which development of minerals in public lands has been encouraged and facilitated. We oppose extension of the leasing system to other minerals than those now covered thereby.

No further national parks or other reservations should be dedicated by law or proclamation whereby mineral resources of importance would be closed to location and development.

MINE INSPECTION AND WATER POLLUTION

Regulation and control of mine inspection and water pollution should continue to be enforced under the police powers of the states.

U. S. BUREAU OF MINES AND U. S. GEOLOGICAL SURVEY

We heartily endorse the work of these agencies and the scope of their activities as now defined. We urge expansion of the educational work of the Health and Safety Branch of the Bureau of Mines.

ST. LAWRENCE WATERWAY AND POWER PROJECT

We reaffirm our opposition to this project. Of doubtful benefit to American economy, it would obstruct national defense by diverting money, men and materials from immediate vital needs, and would create in itself a new vulnerable area requiring vast defense works.

TARIFF

We oppose the Reciprocal Trade Agreements policy which has lowered necessary protection to the domestic mining industry without compensating advantage to the United States.

SECURITIES AND EXCHANGE COMMISSION

We urge that the Securities and Exchange Commission expedite presentation of the new simplified min-

ing registration forms to the mining industry, for consideration prior to adoption.

We commend the Commission for its action in adopting a more liberal exemption rule to aid prospecting and new mining development, and we urge further simplification of mine financing by elimination of requirements which are now too expensive and technical.

MONETARY POLICY

We favor a currency with a metallic base using gold and silver. We endorse the continued purchase and coinage of domestic gold and silver, as provided by law, and urge the repeal of the prohibitions on free circulation of gold.

CONGRESSIONAL CONTROL OF EXPENDITURES

We again urge that each House of Congress create a Committee on the Budget including members responsible for appropriations and members responsible for taxation. Based on its report, each House of Congress should then fix the maximum amount of expenditures for the year, and require that the separate appropriation bills and legislation authorizing appropriations conform to this determination.

TAXATION

In meeting the imperative needs of National Defense we urge that non-defense expenditures be reduced and non-essential expenditures eliminated. Private enterprise and initiative must be protected and encouraged for the contribution it can make to national defense; as a basis for a sound revenue system; as the only permanent solution of unemployment; and as the general basis for the future revenues of the Government and the welfare of the people. Possible sources of revenue should not be strangled by excessive taxation. Adequate revenue can only be raised by fair and equitable taxation.

We recognize the necessity for an excess profits tax, but it should be imposed only upon true excess profits. The present law in many instances subjects normal profits to excess profits tax rates, and will retard and perhaps prohibit normal growth and expansion. The following amendments, if made immediately to apply to 1940 returns, would remove many of the most serious inequities:

Daily computations relating to invested capital should not be required.

The election between the income credit and the invested capital credit should not be required until final determination of tax liability.

The special relief provision should be revised to permit adjustment of abnormalities in base period earnings, in invested capital and in taxable year income, and to permit normal growth.

The income credit should be based upon any three of the four years in the base period.

Rates of tax should not be graduated solely upon the dollar amounts of income.

Provision should be adopted so that the true excess profits will be measured over a period of at least five years.

(*Continued from page 73*)

mally on the strategic minerals procurement program of the Government, and outlined the present position of that program. His remarks were reassuring as to our position this year and for the future in regard many of the strategic minerals—including reserves being developed within the country and the supply to be secured from without. In addition to minerals which are needed in major quantities he also touched on some of those minerals needed only in minor quantities, but in which shortages must be carefully guarded against. These include such things as industrial diamonds, quartz crystals, mica, graphite, asbestos and radium. Even the question of a shortage of sapphires for jeweled bearings in watches and precision instruments has been referred to his office.

President Young then called upon Julian D. Conover, secretary, who presented his annual report upon the activities of the Congress during the past year. His report is herewith presented.

Chairmen of the various standing committees then reported. Erle V. Daveler, chairman, first gave a resume of the work of the Finance Committee and assured the membership that finances of the Congress were in good shape to carry on for the coming year; and that, barring possible contingencies, the budget for the year will be met by expected receipts. H. B. Fernald, chairman of the Taxation Committee, then reported upon the past year's activity, and urged greater attention by mining men to the effect of recently enacted tax legislation, and stated that their assistance is needed in securing amendments to make it workable. A brief verbal report for the Social Security Committee was given by Howard Huston, chairman, who called attention to the many new bills presented to Congress on social security, particularly those creating increased benefits and calling for heavier taxes. He pointed out that the Mining Congress must do what it can to see that measures injurious to the mineral industries are not enacted.

The Nominating Committee, through Herbert Wilson Smith as chairman, presented nominations for directors to fill the places falling vacant in 1941. The nominees were James R. Hobbins, president, Anaconda Copper Mining Company; Neil W. Rice, president, U. S. Smelting, Refining & Mining Company; Merrill E. Shoup, president, The Golden Cycle Corporation; and Howard I. Young, president, American Zinc, Lead & Smelting Company. With E. B. Greene temporarily in the chair, the membership by a unanimous vote approved the nominations, and the four men named were elected for a three year term.

Representatives and distinguished members from each section of the country spoke briefly on the conditions of the mining industry in their districts, and the special problems which the districts must meet. Among these were Roy Miller, Corpus Christi, Tex.; E. B. Greene, Cleveland, Ohio; J. B. Warriner of the Pennsylvania anthracite region; Arthur S. Knoizen of Franklin, Pa., chairman of the Manufacturers Division of the Mining Congress; Evan Just of the Tri-State zinc-lead district; N. W. Rice of Boston; H. B. McNary, Mt. Hope, W. Va.; T. R. Johns of Johnstown, Pa.; and H. C. Parmelee, New York. All stressed the importance of continued cooperation in the efforts of mining's national organization.

(*Concluded on page 94*)

The Mining Congress in 1940

● ***Report of Julian D. Conover, Secretary, at 43rd Annual Meeting, Washington, D. C., January 29, 1941.***

THIS is a business meeting, and not one for long speeches or elaborate reports. You are all well acquainted with our work in the past year, and there is no need of my discussing it in detail. I will simply take a few minutes to sum up certain legislative and other matters that have required our attention, with brief reference to problems that lie ahead.

Today the problems of national defense are paramount. Controversy may exist as to methods, but all are agreed as to the vital need for complete defense. For the time being everything else is subordinate. Such a concentration of effort is needed if this tremendous task is to be accomplished in time to preserve our American way of life.

Yet in this great effort we must not lose sight of the basic principles under which our nation has grown and our natural resources have been developed. We must not destroy the incentive to further development of urgently needed metals and minerals, nor impose unnecessary burdens which would impede full production. The mining industry has pledged its whole-hearted cooperation to our government, and we should fail in our duty if we did not point out our problems to those who determine governmental policies, to the end that the industry may not be ham-strung by ill-advised action.

Labor

Maximum production can be accomplished only through teamwork. Influences, however well-intentioned, which tend to break up good teamwork between management and workmen have no place in a national defense program.

The Wagner Act, as administered in the past five years, has tended to destroy cooperative relations between employer and employe, and more recently the Wage-Hour Act in its artificial restrictions upon working hours has seriously hindered many mining operations. Our efforts have consistently been directed toward the removal of these obstructions.

This past year amendments to the Wagner Act, embodying many of the principles urged by the mining industry before the committees of Congress, were passed by a heavy vote in the House of Representatives, but were

stalled by dilatory tactics in the Senate Committee. Although the National Labor Relations Board has now been reconstituted, the basic defects in the law have not been remedied. Labor conflicts, disputes and strikes which throttle defense production may in considerable part be laid at its door. Public sentiment will not indefinitely tolerate such abuses, and there are growing indications that corrective action on several fronts may be seriously considered in the present session.

The Wage-Hour Act has likewise continued to create difficulties for the mining industry. Sweeping interpretations as to the "freezing" of wage scales, the overtime penalties, the application of the act to mining lessees, attendance at safety meetings, and the recent discussions of what constitutes "hours worked" in various types of mining, have served to emphasize the misunderstandings, hardships and disruption of long established and mutually satisfactory working practices which result when a blanket law designed to correct sweatshop conditions is applied to a far-flung and high wage industry such as mining. In far too many cases the law has served not to increase but to curtail employment and earning power, thus doing the direct opposite of what Congress intended. Continued efforts have been made to amend the act, and last spring several amendments helpful to mining were adopted by the House of Representatives; unfortunately, however, the bill subsequently became so confused that it was returned in desperation to the Labor Committee, never to reemerge. The dissatisfaction evident at that time persists, and there is heated argument, pro and con, over the law's effect on the defense program. Organized labor strongly supports the act, and the prospects for amendment in the current session remain in doubt.

We also supported the Walter-Logan bill, which would have required administrative agencies to formulate definite rules of procedure and would have subjected their rulings to adequate court review. This was passed by both Houses but vetoed by the President, following which the Congress failed to override the veto. Further prospects for such legislation are affected by the report of the Attorney General's Committee on Administrative Procedure, just released, which is definitely critical of certain existing practices.

Taxation

The year 1940 saw the enactment of two revenue acts, each of which materially increases the tax burden on mining and other corporations. The need for higher taxes to meet in part the enormous expenditures for national defense is recognized by all, but such taxes must be fair and equitable, reasonably simple, and must not choke off needed development and production.

The excess profits tax as proposed met none of these requirements; it was inconceivably complicated and was discriminatory and unjust to many mining taxpayers. The mining industry and the Senators and Congressmen from mining states contributed largely to its simplification and to correction of several of its worst features. The law as enacted recognizes earnings of the base period as well as invested capital in determining excess profits. It allows a flat rate of 8 percent on invested capital. It recognizes that special relief must be accorded in many cases. It recognizes in part that excess profits should be measured over a term of years, through permitting the carrying forward of an unused excess profits credit. It permits consolidated returns. It provides exemption from the excess profits tax for production of vitally needed strategic minerals. Each of these points was the subject of controversy, and their inclusion in the act did much to mitigate harshness and injustice.

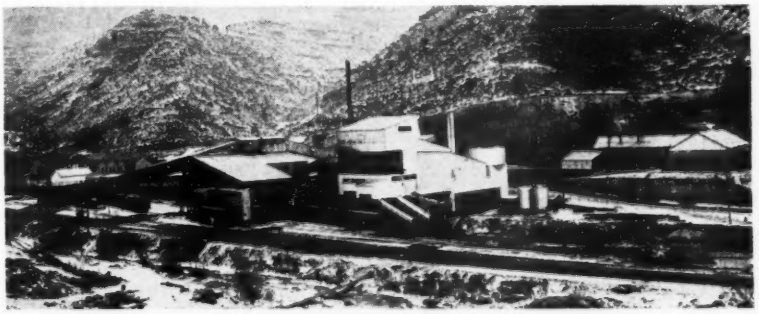
Nevertheless the haste with which a law so far reaching in its effect was enacted has resulted in many serious difficulties, which should be corrected before 1940 taxes are payable. Our counsel, the chairman and members of our Executive Tax Committee and our JOURNAL and bulletins have given much attention to this subject, and needed amendments will be urged with all possible vigor.

Federal Mine Inspection

On January 18 of last year, while our annual meeting was in progress, the Senate passed the Federal Mine Inspection bill. In its practical application this was *not* a measure to promote mine safety, but one which would have set up a centralized political control of coal mine operations. An amendment proposed but not adopted in the Senate would have extended its scope to cover all metal and nonmetallic mines as well.

We continued to oppose this bill and made a strong statement before the House subcommittee, recommending in its place an expansion of the present educational work of the Health and Safety Branch of the U. S. Bureau of Mines. The subcommittee approved this recommendation and refused to report the bill, following which strong efforts, by organized labor and by the Department of the Interior, to discharge the committee and bring the bill before the House met with failure.

In the present session, compulsory mine inspection bills have again been introduced, and will no doubt be strongly pushed. We hold definitely to the view that they are not the key to greater safety, which depends on teamwork, education, and unceasing effort to develop a "safety consciousness" on the part of every man in the mine. The American Mining Congress is continuing its cooperation with all those genuinely interested in accident prevention; safety is one of the primary subjects considered at our coal and metal mining conventions, and the MINING CONGRESS JOURNAL has adopted a definite editorial policy of devoting space each month to furthering the cause of mine safety.



A modern preparation plant in the West Virginia coal fields

Strategic Minerals

National defense needs have brought to a focus our country's deficiencies in certain essential minerals. Provision for acquiring supplies of these minerals has been made in the army and navy appropriation bills, and funds have been provided for the Bureau of Mines and Geological Survey to continue their investigation of domestic sources.

Typifying the use of strategic metals for defense is the airplane, in which these metals find necessary application in strong, light alloys

To assist in the development of domestic deposits, the 76th Congress broadened the powers of the R. F. C. to make mining loans. Class "B" loans may now be made on deposits of any of the strategic or critical minerals, in addition to gold, silver and tin, and the permissible amount of any such loan has been doubled. In the coming session further effort is to be made in behalf of the small mine operators of the West, to authorize R. F. C. loans for the unwatering, retimbering, and preliminary development of small mining properties.

Securities and Exchange Commission

Our committee on cooperation with the S. E. C. has continued its efforts toward simplifying the requirements for mine financing. A new and improved regulation covering exemptions for securities issues of $100,000 or less was finally issued by the S. E. C. in December, 1940. Despite repeated promises, however, the revised form A-O-1 for registering securities of primary mining ventures has not yet been released.

Foreign Trade Agreements

The President's authority to negotiate trade agreements with foreign countries, which expired last June, was extended by Congress for another three years. The importance of this action is, of course, overshadowed by our present war economy, yet it may hold serious implications for certain branches of the mineral industry in the future.

In the hearings before the House and Senate Committees, we urged that the trade agreement program be modified to protect established domestic industries against arbitrary action by the State Department. We asked for definite provisions, limiting duty concessions on any article to that country which constitutes the principal source of imports; making mandatory the invoking of "escape" clauses when third countries receive the principal benefits or when a domestic industry is seriously damaged, and requiring ratification of trade agreements by the Senate. Strong support of our position was received from Senators and Representatives from the mining states of the West, but administration pressure defeated all proposed amendments.

Monetary Legislation

No new monetary legislation was enacted in 1940. A bill by Senator Townsend, ostensibly designed to stop further purchases of foreign silver, was found to be so broadly drawn that it would also have repealed the law under which domestic producers receive a fixed coinage rate for their silver. This matter was explained to the Senate Banking and Currency Committee, which rewrote the bill so that it would apply exclusively to foreign silver. This, however, met opposition from the Treasury and was not enacted.

In the current session legislation has been introduced which would repeal the President's powers to further devalue the dollar, to issue three billion dollars in greenbacks, and to issue silver certificates in excess of the amounts paid by the Treasury for its silver stocks. Such legislation has been recommended by the Federal Reserve Board, but has not been endorsed by the Treasury. Thus far no measures have been proposed to change the present statutory provisions for coinage of domestic silver. Increasing support is being given to proposals such as urged by the American Mining Congress, to restore gold coinage and gold certificates to circulation.

Stream Pollution

The Barkley-Mansfield water pollution bill, providing for cooperation by the Public Health Service in studies of local pollution problems, was reported to the House in May, 1940. There, however, the Mundt amendments, prohibiting any "new source of pollution" without a Federal certificate of approval, were adopted. Conferees were unable to reach agreement and the legislation died with the close of the 76th Congress. It will undoubtedly be an active issue again this year. We have consistently opposed drastic Federal control of these local problems and shall continue to do so.

St. Lawrence Waterway

The St. Lawrence Waterway and Power Project has again come to the fore, this time under the guise of national defense. The President has recently allocated a million dollars for preliminary surveys and has urged immediate completion of the project, to supply power for defense production and to make possible the building of ocean ships on the Great Lakes. A thorough educational program will be needed to bring out the utter fallacy of these arguments, as applied to a project which could not be completed for several years, and which would divert tremendous amounts of money and man power from national defense. The problem is more acute than ever before, in view of the apparent determination not to submit a treaty for ratification by the Senate, but merely a resolution supplementing the Boundary Waters Treaty of 1909, and requiring a simple majority vote in each House.

General

An attempt to transfer the Forestry Service to the control of the Department of the Interior was made early last year. This was strongly opposed by our organization, along with others interested in the orderly development of natural resources on the public lands, and the transfer did not materialize. The withdrawal of public lands from mineral entry and location continues to be a live issue in Alaska and the western states.

The TNEC, or so-called "Monopoly Committee," has concluded its hear-

ings and its final report is to be submitted in April of this year. It is predicted that Senator O'Mahoney, chairman of this committee, will revive his Federal Licensing Bill, which would require a Federal charter and set up detailed Federal regulation for every corporation doing interstate business.

In the 76th Congress, a total of 17,244 bills and resolutions were introduced. All of these were scrutinized by our office; 222 of them, which were found to be of particular concern to mining, were reported in detail and their legislative status followed in our bulletins. In the 77th Congress, some 4,000 bills and resolutions have already been introduced, and much legislation of far-reaching importance to mining will undoubtedly be considered. We shall try to keep you advised, and we ask that each member of the industry exercise his constitutional right to express his views as matters of importance arise.

May we at this time, also, express our appreciation to the numerous state and local mining organizations throughout the country, who work with and through the American Mining Congress on national matters. The thousands of small mine operators thus brought together with a common voice are a strong force for the protection and advancement of the industry, the value of which cannot be overestimated.

An exchange of information between these organizations in the metal mining states has again been undertaken, covering all important state legislation affecting mining. The American Mining Congress, in accordance with established policy, takes no part in any state matter, but this interchange is found extremely helpful by the industry locally in protecting its interests.

The MINING CONGRESS JOURNAL has continued its distinctive service to the industry. Our former editor, Richard J. Lund, has accepted an executive post in the National Defense Commission, now the Office for Production Management, and Russell C. Fleming has been appointed to the editorship. Mr. Lund did much to raise the editorial standards of the JOURNAL, and Mr. Fleming is eminently qualified to carry it forward to still greater accomplishments.

The year 1940 saw two of the most successful conventions and expositions we have ever held. Attendance of 5,066 at our Cincinnati coal convention was the largest on record. This annual Coal Show with its discussions of operating and economic problems, and the work of our Coal Division throughout the year, are the leading factors in development of better methods and machinery for mining coal and enabling it to meet the competition of other fuels. The metal mining convention at Colorado Springs, with a registration of 1,702, did much to focus attention of the industry, the public and members of Congress on mining's problems. Progress in operating practice also received increased attention and in response to a growing demand, succeeding conventions will devote still further consideration to this subject. At both these meetings the manufacturers of mining machinery and supplies presented impressive exhibits, and their continued cooperation in solving the industry's difficulties cannot be too highly commended.

The Mining Congress has been materially strengthened in 1940 both financially and in its contacts with mining men and organizations throughout the country. It is prepared to do its utmost in meeting the critical problems which lie before us in 1941.

Power plant of Pend Oreille Mines and Metals Company, Metaline Falls, Wash.

WHEELS of Government

● *As Viewed by A. W. Dickinson of the American Mining Congress*

AN "all out for defense" atmosphere pervades the nation's capital as the new year and a new Congress get under way. Lights blaze into the small hours of the morning in the buildings occupied by the State, War and Navy Departments and by the many branches of the Office of Production Management.

Final organization of the many committees of the Senate and House of Representatives was somewhat delayed by the activities of the Presidential Inauguration, but soon after January 20 this work was completed and the committees are now beginning to function. Three Democratic vacancies on the important House Ways and Means Committee were filled by Knute Hill of Washington, A. L. Ford of Mississippi and Arthur D. Healey of Massachusetts. Appointed to the Senate Finance Committee were two Republicans, Taft of Ohio and Danaher of Connecticut. Of interest to the mining regions were the appointments of Fadjo Cravens of Arkansas to the House Committee on Judiciary, A. B. Kelley of Pennsylvania to House Mines and Mining, Clinton P. Anderson of New Mexico to Public Lands together with Rankin of Montana, Chenoweth of Colorado and Robertson of North Dakota, all Republicans, to the same committee. Jack Nichols (Dem.) of Oklahoma, filled the sole vacancy on the House Rules Committee and William S. Hill (Rep.) of Colorado, was assigned to the House Committee on Labor.

On the Senate Committee on Banking and Currency are two new Republican members, Senators John Thomas of Idaho, and Joseph H. Ball of Minnesota. To the Committee on Commerce which handles stream pollution bills went Democratic Senators Prentiss M. Brown of Michigan, and Mon C. Wallgren of Washington, together with Republicans Ralph O. Brewster of Maine, and Harold H. Burton of Ohio. Democrats D. Worth Clark of Idaho, James M. Tunnell of Delaware, and Ernest W. McFarland of Arizona, are new appointees to the Committee on Interstate Commerce and C. Wayland Brooks of Illinois, is the new Republican member. Senators Abe Murdock of Utah, and McFarland of Arizona, are new Democrats on Judiciary and the new Republicans are Burton of Ohio, and William Langer of North Dakota. The Committee on Mines and Mining receives three Democrats, Berkeley L. Bunker of Nevada, Wallgren of Washington, and Harley N. Kilgore of West Virginia. On Education and Labor are Dennis Chavez of New Mexico, H. H. Schwartz of Wyoming, James N. Mead of New York, and Bunker of Nevada, all Democrats, and Ball of Minnesota, and Hugh A. Butler of Nebraska, Republicans.

The loss of Senators Ashurst, King and Pittman with their experience, ability and high-committee rank will be of serious concern to the mineral-producing areas of the country until the more recently elected men of the majority party have had a sufficient opportunity to become equally versed in threading the maze of Congressional procedure.

Demand for Revenue

Early in January the President's budget message gave indication of what may be expected in demands for additional revenues when the House Ways and Means Committee begins consideration of a general revenue bill early in April. A 17½ billion dollar budget with 8 billion dollars of estimated revenue receipts will leave a 9½ billion dollar deficit, and early enactment is anticipated of a bill extending the national debt limit to $65,000,000,000 and making Federal security issues subject to income tax levy.

While the Treasury's recommendation on clarification of the relief provisions of the Excess Profits Tax Act of 1940 is understood to have been presented to the White House, there are many taxpayers who are deeply concerned over other provisions of this law which should be corrected and clarified by legislative means in time to mitigate hardship and injustice before income tax returns are due for the taxable year 1940. Taxpayers should immediately communicate their views concerning such amendments to their congressional delegations.

A bill was quickly enacted at the end of January amending Section 124 of the Internal Revenue Code to extend the time for certification of national defense facilities and contracts in connection with amortization deductions. The large number of applications for these certificates has caused a congestion in the issuing offices because, under the existing provisions for amortization, a necessity certificate with respect to an emergency facility, entitling the taxpayer to take amortization, must be made by the Defense Commission and the Secretary of War or the Secretary of the Navy before the beginning of construction or date of acquisition of the facility, or before February 5, 1941, whichever date is later. This meant that with respect to facilities begun or acquired before February 5, the certificate must be obtained by that date, and with respect to facilities begun or acquired after February 5, the certificate must be obtained before the beginning of such construction or the date of such acquisition. The amendment just enacted changes this provision to require that an application for a necessity certificate be filed before the expiration of 60 days after the beginning of construction or the date of acquisition of a facility, or before February 5, 1941, whichever date is later.

A joint resolution has been introduced by Senator Guffey of Pennsylvania, and Representative Pat Boland of the Pennsylvania anthracite region, to extend the life of the Bituminous Coal Act of 1937 (Guffey Act) for two years, from April 26, 1941. It will be remembered that this act carries a tax of 1 cent per ton on all bituminous coal production.

"Hours Worked" in Mines

The statement made by Vice President D. M. Kelly of the Anaconda Copper Mining Company at the Wage-Hour Conference in Salt Lake City on December 12 last, when he said "It is my opinion that the Congress of the United States fully intended that the 40-hour week should be a 40-hour week at the point of production" was fully justified by the testimony presented at a further conference held in Birmingham, Ala., on January 14 and 15. All testimony showed clearly that for many years, eight hours of the working shift have been put in by the men "in and around the usual working places."

Also at Birmingham President Reid Robinson of the International Union of Mine, Mill and Smelter Workers read a prepared statement in which he urged that all hours spent by the employe on company property be included in the computation of the workday. Employe witnesses from the iron ore mines of the Tennessee, Coal, Iron and Railroad Company, Republic Steel Corporation, Sloss-Sheffield Steel Corporation and the Woodward Iron Company were presented by General Counsel Lee Pressman of the CIO and local counsel, J. L. Busby, of the AFL.

Counsel Borden Burr for the Tennessee Coal, Iron and Railroad Company and Republic Steel Corporation, presented E. M. Ball, manager of mines for the TCI, who testified that underground employes are required by written agreement to work eight hours at the usual working places and that the employer exercises no further control over the men while they are on the property other than that which, in ordinary discretion, is necessary to the safety of everyone. With such a clean-cut presentation of custom and practice governing the working hours of underground shifts, it is difficult to see how the Wage-Hour Administrator can render an opinion differing materially from that which he gave on the hours of the working shift in coal mines. Briefs which mining companies or others wish to file will be accepted by Examiner Harold Stein if placed in the mail by February 20.

Counsel for the San Francisco office, Wage-Hour Division, Department of Labor, has tentatively set the date of March 18 for a hearing at Salt Lake City on the subject of the status of mine leasers under the Wage-Hour Act. This concerns a large number of men who normally work in the mines of Utah and other western states but who have been thrown into idleness because of attempts on the part of Federal agencies to classify them as "employes" of the mining companies.

Federal Inspection Again

Discarded as unwarranted and unnecessary after full hearings and consideration by the last session of Congress, the Federal Mine Inspection Bill issue has been raised again by the introduction of bills by Representatives Smith of West Virginia, and Flannery and Moser of Pennsylvania. The United Mine Workers are supporting the Flannery bill, which, while not differing widely from the usual form, in effect requires the selection of inspectors from among the membership of the Mine Workers.

Reviving the Walter-Logan Principle

When the President, at the end of the last session, vetoed the Walter-Logan bill regulating administrative acts of federal agencies, he stated that the veto power was used in anticipation of the issuance of the pending report by the Attorney General's Committee on Administrative Procedure. Late in January this report was made public.

A minority report called for more detailed provisions governing the conduct of administrative adjudication and for more specific provisions covering the review jurisdiction of courts. Senators Hatch of New Mexico, and Van Nuys of Indiana, immediately introduced S. 674 and S. 675 which respectively present the views of the minority and majority reports of the Attorney General's Committee and hearings before a Senate Judiciary subcommittee are expected to begin in February.

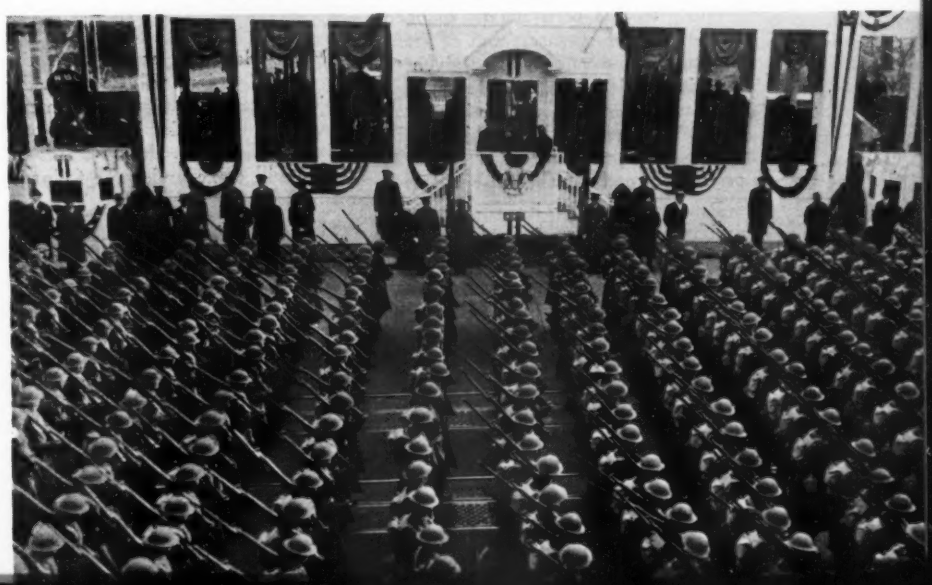
Action on Defense Metals

The new Office of Production Management which has succeeded the National Defense Advisory Commission is continuing the work of procurement and assurance of a sufficient supply of vital materials from the metal industry.

Director E. R. Stettinius of the OPM's Division of Priority, has announced the appointment of Dr. Ernest N. Hopkins, Minerals of Dartmouth University, as chairman of a Non-Ferrous Metals and Minerals Priority Committee; his assistant will be Dr. S. S. Stratton. Members of the committee are Irving Cornell, vice president, St. Joseph Lead Company, representing the producers; H. L. Erlicher, vice president in charge of purchases, General Electric Company, representing the industrial consumers; Colonel W. R. Slaughter, representing the Army; and Commander W. H. Von Dreels, representing the Navy.

Newly elected Senator Ernest W. McFarland of Arizona has joined Representative John R. Murdock of that state in the introduction of a bill to provide small RFC loans, not to exceed $5,000, for the purpose of financing unwatering, retimbering, making accessible, or preliminary development of mine workings, or the sampling or assaying of ore therefrom, when, in the opinion of the Reconstruction Finance Corporation, the expenditure of such funds may make accessible, or reveal, sufficient mineral showings to warrant the making of a development loan to such borrower. The security given is a lien upon the ore or mineral developed and the borrower agrees to apply 10 percent of the net mill, smelter or mint returns, or, in the case of minerals not milled, smelted, or minted, 10 percent of the net market returns, to the repayment of the loan.

Inaugural Parade Passes Presidential Stand



— Chairmen of Committees on Arrangements —

J. B. MORROW
Attendance

A. C. GREEN
Publicity

D. H. PAPE
Floor

B. H. SCHULL
Welcoming

18th Annual Coal Show

APRIL 28 – MAY 2

The Coal Industry on Parade

J. H. FULFORD
Entertainment

THOUGHTS of coal men throughout the country are turning to the big Annual Coal Show to be held in Cincinnati, April 28-May 2, 1941. With mining on the upgrade and production rising, this, the 18th Annual Coal Convention and Exposition of the American Mining Congress, promises to be the biggest and best ever held.

The Program Committee is scheduling papers on every important phase of coal mining. Final announcement cannot yet be made of all speakers and subjects to be presented, but every effort is being made to have the work completed at an early date. In formulating the program, the advice and cooperation has been sought of men in the field, of operators and of manufacturers, and care is being given to selecting subjects that will represent a cross-section of the best mining practices. Speakers on these subjects will be specialists who have had wide experience in each of the fields covered.

Papers will deal with fundamental problems and their solution. Modernization in coal mining has progressed to the point where it is no longer necessary to take the time to describe routine equipment methods and installation, and details of machine operations. The more important phases are the economic factors involved, the problems of supervision, the ways of reducing cost; these questions are the ones which the coal industry is trying to answer, and the Program Committee is holding to the purpose of helping to find the answers.

Conditions vary from mine to mine, from district to district and from state to state. Mining methods must be adapted to meet these various conditions. The majority of papers will be of interest to all mining men but certain of them will be more limited in their application. For instance, two special sessions, one on Tuesday afternoon, April 29, and one on the following day, Wednesday, will be devoted to papers and discussions of problems in coal stripping. These special sessions will be held in a separate meeting room in Music Hall, and at the same time the regular sessions will be devoted to subjects that are of primary interest to underground mine operators only.

In broad outline, the questions discussed will come under the following major heads:

Mechanical Loading

Operations with track mounted and tractor machines will be described; particular attention will be given to the important question of service haulage and in addition to direct loading in the mine cars. Included will be papers on rubber-tired shuttle haulage, transfer cars operating on tracks between the loading machine and the main line, and a new type of operation where a dragbox moved by rope hoists is used between the face and the room neck. Other phases of mechanical loading to be covered are cutting, drilling, blasting, track, roof support and auxiliary operations.

Conveyor Mining

A comprehensive account of modern conveyor mining will be given, describing duckbill mechanical loading, systems of hand loading and multiple units with gathering belts. Discussions will cover problems of roof support and ventilation, as well as the important question of double and triple shifting.

Equipment Maintenance

This subject will be scheduled for presentation between the session on mobile loaders and conveyors as it applies equally to all types of mechanized mining. The papers will stress power lubrication and in general, methods that are used to keep machines running and eliminate delays during shifts.

Surface Preparation

Consistent demand for a clean, well-sized product continues to introduce additional problems in coal preparation, and papers will be presented dealing with some of the more fundamental problems of cleaning and screening. Drying and dewatering of washed coal, the preparation of stoker and other premium sizes will also be discussed and special attention will be given to methods that are applicable to the small operator, as well as to the large producer.

Safety

This subject will, as usual, receive major attention, and there will be three papers on important phases of accident prevention. Instead of confining this to one session as has been customary in the past, the papers will be interspersed with other pertinent subjects at the convention throughout the week so that everyone will have opportunity to hear at least one, and possibly two. The papers will stress ways to eliminate accident sources introduced by mechanization, and particular attention will be given to rock dusting, ventilation, and recommended procedures for mines where gas or dust hazards exist.

Coal Stripping

At two special sessions on strip mining will be presented six papers covering exploration methods, hydraulic stripping, overburden preparation, haulage and maintenance. Included will be applications of interest to the small as well as to the large producer.

National Economics

In addition to discussions of operating methods as such, there are a number of other matters that directly concern the operating personnel, such as federal regulation, national defense, training and education of men in the new technique of mechanization. Certain of these questions of national importance to the coal industry will be presented for discussion.

"Information—We Hope"

An entirely new method of presenting and discussing operating problems will be inaugurated this year, under the title of "Information—We Hope." The procedure will follow somewhat the lines of the popular radio program "Information, Please," and a group of four or five well-known coal operating men will be on the platform to answer questions on mining problems. The object will not be to "stump" the experts, but to get the benefit of their experience; some questions will be submitted in advance so that these men will have time to prepare their answers, while others will be asked voluntarily from the floor. Two of these sessions are proposed, one for Tuesday morning, and one for Thursday morning, each scheduled to last for at least thirty minutes. Plans now in preparation will make this an extremely valuable addition to the regular program, and full details will be announced later.

Entertainment

Arrangements for entertainment features got into full swing with a meeting of the Entertainment Committee at Cincinnati on February 11, and a gathering of the Publicity Committee at Pittsburgh on February 12. A big turn-out of each committee was present, and the discussion centered around getting out the greatest possible crowd of mining men and making their Cincinnati visit a most enjoyable one.

Full entertainment details will be announced later, but as the result of popular demand, the Entertainment Committee has definitely scheduled another Fight Night—a series of amateur boxing matches between AAU champions representing coal mining companies throughout the country. Anyone who attended the fights last year can well remember that "all out" doesn't necessarily apply to war only. From the starting gong, the scrappy coal mine contestants threw leather high and wide, seeking to add another scalp to their belt and to take home one of the coveted Coal Show wrist watches, given as prizes.

This year it is hoped that there may be an even more representative turnout of boxers from the coal fields, and everyone is asked to send in the name of anyone interested in appearing in the Coal Show ring at Cincinnati. The entire affair will be carried through on regular AAU rules, and the contests will be supervised by competent officials.

Exposition

The SRO sign is all polished up for use on the exposition, and present indications are that it will be hung out at any time. Allocation of exhibit space to manufacturers on January 30 showed reservations to be greater than for any previous year in the history of these meetings, with only six or eight booths remaining for late-comers.

With a view that the demands on the coal industry will be gradually stepped up, manufacturers of mining equipment and supplies are getting set to "shoot the works" at the Coal Show in presenting a complete array of mining necessities. Visitors have in store for them many surprises in the way of brand new equipment, as well as a lot of new adaptations of old standbys. The national defense program has already emphasized the need of keeping present equipment in service as long as possible, and it is fully expected that a great share of attention will be given to replacement parts and adequate maintenance programs.

Modernization of coal methods has not been loafing in past years, but it may seem that way in view of what the next few years will bring. Operating men should remember that the term "progressive coal mining man" is only relative and that the safest way to avoid being left behind is to take full advantage of the opportunities offered by the more than 140 leading manufacturers at the Coal Show. Everyone from the boss down can well afford to spend a greater part of convention week in close contact with the trained representatives and engineering personnel of the manufacturers who must serve their equipment and supply needs.

Make your plans now to be in Cincinnati April 28-May 2—and bring another coal man with you.

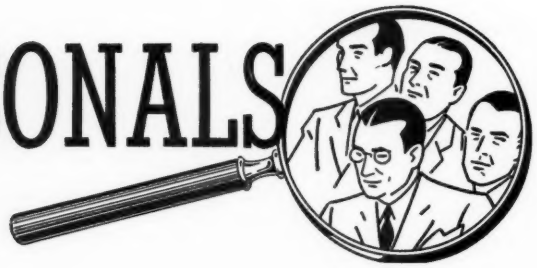
COAL SHOW BOXING TOURNEY

NETHERLAND PLAZA HOTEL, CINCINNATI, OHIO—APRIL 30

Open to A.A.U. members only. Handsome prizes to the winners, and a free trip to Cincinnati for all participants.

Address the American Mining Congress, Munsey Building, Washington, D. C., for further information and entry blanks.

PERSONALS



J. W. Garvey, general manager of the Maryland New River Coal Company at Winonah, W. Va., has been reelected president of the New River Coal Operators Association. **P. M. Snyder**, Charleston, Koppers Coal Company, was reelected treasurer.

Julian E. Tobey, Cincinnati, Ohio, has been appointed by Governor Bricker as a member of the State Board of Registration for engineers and surveyors. Mr. Tobey is vice president in charge of engineering for Appalachian Coals, Inc.

Arthur V. Rohweder of Duluth has been reelected president of the Minnesota Safety Council for the third consecutive year.

C. W. Allen, Ishpeming, Mich., formerly superintendent of the Lloyd mine of the Cleveland-Cliffs Iron Co., has been transferred to take charge of the new section 2 iron mine development at Ishpeming of the same company.

Dr. Eldred Wilson has been making an investigation of tungsten deposits in Arizona. The Arizona State Bureau of Mines, Tucson, will soon issue a special bulletin on the subject based upon Dr. Wilson's investigation.

K. G. Link is the new superintentendent of the Bishop, Calif., mine of the U. S. Vanadium Corporation. He was formerly superintendent of the Hidden Treasure mine of the U. S. Smelting, Refining & Mining Company at Ophir, Utah.

P. C. Fedderson has been made general superintendent of the Bunker Hill smelter at Kellogg, Idaho, succeeding the late **Arthur M. Beaslery.**

Charles Reed of Rapid City, S. Dak., was elected president of the Black Hills Mining and Industrial Association, at the annual meeting of the association recently. **J. D. Johnson**, of Lead, was elected vice president.

W. E. Dunkle, president and manager of the Golden Zone mine in the Broad Pass district of Alaska has announced the completion of a new mill at the mine. The mill will handle 125 tons per day and the mine is regarded as one of the most promising lode operations in Alaska.

Joseph H. Taylor, Silver City, N. Mex., has been elected vice president of Peru Mining Company. He will continue in charge of the company's mine at Hanover and the mill at Deming.

Samuel H. Williston has been elected president of the Oregon Mining Association, succeeding **Leverett Davis.** Mr. Williston is vice president of the Horse Heaven Mines and has offices in Portland, Ore. At the same time **D. Ford McCormick** of the Sterling Mine, Medford, Ore., was elected vice president of the association; and **F. Whalley Watson**, Portland, will be secretary-treasurer.

James J. Carrigan, Butte, Mont., manager of mines for the Anaconda Copper Mining Company was elected chairman for 1941 of the Montana section of the A. I. M. E. **S. S. Rogers** of Anaconda is vice chairman and **Chas. C. Goddard, Jr.**, of Butte, is secretary-treasurer.

T. L. McCall has been designated general manager of the Dominion Coal Company and the Cumberland Railway and Coal Company, both in Canada. Mr. McCall will continue to act as chief mining engineer for the Dominion Steel & Coal Corp.

J. Murray Riddell on the first of the year joined the staff of the E. J. Longyear Company, Minneapolis, Minn., as manager of its mining division. He will supervise the company's contract shaft sinking operations and act as consulting mining engineer to the clientele of that company. A graduate of Michigan College of Mining and Technology he has served the mining industry in many ways. From 1932 to 1935 he was manager of mines for the Corrigan, McKinney Steel Company and after that company incorporated with the Republic Steel Company he was assistant manager of Republic's northern ore mines.

L. Ebersole Gaines of Fayetteville, W. Va., president of the New River Coal Company, has been chosen president of the West Virginia Coal Association. Mr. Gaines succeeds **J. G. Bradley**, president of the Elk River Coal & Lumber Co. **Laurence B. Tierney**, Bluefield, was elected vice president, succeeding **Dr. Gory Hogg** of Lewisburg, resigned, and **D. Holmes Morton** of Charleston was named treasurer to succeed **C. C. Dickinson**, resigned. **Jesse V. Sullivan** of Charleston was reelected secretary.

Harry LaViers, president of the Big Sandy-Elkhorn Coal Operators Association and vice president of the Southeast Coal Company has been instrumental in the formation of the Princess Elkhorn Coal Company, Paintsville, Ky. The new company will operate in the Elkhorn Seam on a lease on Miller's Creek in Floyd and Magoffin Counties, Ky.

Hubert Merriweather, general manager of ore properties of the Bethlehem Steel Company, has gone to South America to visit the Tofo Iron Mine in Chile, operated by the Bethlehem-Chile Iron Mines Company.

M. C. Gentry, mining engineer, and assistant to the president of the Freeport Sulphur Co., New York City, has been elected a vice president of the company.

M. C. Bellamy, formerly sales engineer of the Seattle office of the Timken Roller Bearing Company has been made district manager of industrial bearing and steel sales for the northwest territory, with headquarters at Seattle.

J. E. Westervelt has been elected president of the Sovereign Pocahontas Company, New York City, to succeed the late W. A. Richards who passed away in December. Mr. Westervelt had been vice president in charge of sales of the company.

J. C. Kinnear of McGill, Nev., was recently reelected president of the Nevada Mine Operators Association at its annual meeting at Reno. Other officers elected were **H. A. Johnson**, Tonopah, first vice president; **E. A. Julian**, Goldfield, second vice president, and **Henry M. Rives**, Reno, secretary and treasurer.

W. L. Doolittle, formerly chief engineer for Consolidation Coal Company, has been appointed general manager of all operations with offices in Fairmont, W. Va., filling the vacancy made by the death of W. J. Wolf. Other changes in personnel of the company have been made as follows: **M. H. Forester,** assistant general manager of operations, with headquarters in the Watson Building, Fairmont, W. Va.; **Herbert B. Husband,** division manager of the Kentucky division, embracing Elkhorn and Miller's Creek districts, with headquarters at Jenkins, Ky., succeeding **T. W. English,** resigned; **L. H. Schnerr,** division manager of the West Virginia division with headquarters in the Watson Building, Fairmont, W. Va.; **George R. Higinbotham,** division manager of the Pennsylvania division with headquarters at Somerset, Pa.

E. A. Siemon, division superintendent for the Hillman Coal & Coke Co., was recently elected president of the Coal Mining Institute of America at the annual meeting in Pittsburgh. Vice presidents elected at the same time were **J. J. Forbes,** U. S. Bureau of Mines; **F. W. Howarth,** state mine inspector; and **W. P. Vance,** general superintendent, Butler Consolidated Coal Co.

Walter M. Dake has assumed his duties as managing editor of *Engineering and Mining Journal.* Since 1939 he had been managing editor of *Coal Age* and before that manager of research for the McGraw-Hill publications. **J. H. Edwards,** a new addition to the staff of the *Engineering and Mining Journal,* is electrical editor. At the same time, **H. C. Chellson** was promoted to associate editor.

Kenneth Bartlett, formerly inspector of the Marion and Preston division of the Industrial Collieries Corporation has been promoted to the position of superintendent of Mine 42, Barrackville, W. Va. **E. Y. Luy,** formerly a section foreman of Mine 41 of the same company has been made inspector of the Preston and Marion division, northern West Virginia, replacing Mr. Bartlett.

Frank S. Crawford, district engineer of the United States Bureau of Mines was recently transferred from Duluth to be engineer in charge at the Phoenix, Ariz., office of the Bureau.

Frank E. Cash, formerly district engineer for the Bureau of Mines at Birmingham, Ala., has been appointed in the same capacity to the Duluth office to succeed Mr. Crawford.

R. M. Marshall has accepted the position as a deputy vice president with the Pittsburgh Coke & Iron Co. He was formerly vice president of the Woodward Iron Co., and has previously been connected with the Sloss-Sheffield Steel & Iron Co., as vice president and general manager for several years.

Carel Robinson and **Neil Robinson,** mining engineers, announce the opening of offices in the Union Building, Charleston, W. Va., specializing in coal mine mechanization.

G. J. Stollings, Mallory, W. Va., has been made vice president of the new Princess Elkhorn Coal Company, which will operate in Floyd and Magoffin Counties, Ky.

C. F. Denny of Joplin, Mo., company manager, The Hopi Mining Co., announces the reopening of a field shaft on the Crane lease near Joplin.

Harlan E. Oehler, formerly preparation engineer, Franklin County Coal Corp., Herrin, Ill., is now production engineer with the Bixby-Zimmer Engineering Co., Galesburg, Ill.

Percy Jenkins has been appointed manager of the New England district for the John A. Roebling's Sons Co., with headquarters in Boston. Mr. Jenkins was formerly manager of sales in the New England district for the Wickwire Spencer Steel Co.

H. C. Bellinger, New York City, has retired from active duty as vice president of the Chile Exploration Co.

Alfred K. Snelgrove, head of the Department of Geology at the Michigan College of Mining and Technology, Houghton, was recently guest speaker at the sixth annual banquet of the Gogebic Range Engineers' Club at Ironwood, Mich. His subject was "Minerals and International Affairs."

O. B. Pryor has been made vice president in charge of operations by the Valley Camp Coal Company, with headquarters at Elm Grove, W. Va. He was formerly general mine manager and has been associated with the company for more than 20 years.

Harry H. Gregg was elected president of the Solid Fuel Institute of Milwaukee at the recent annual meeting. Other officers elected were **H. B. Taylor,** vice president; **James F. Caveney,** secretary; and **Edwin W. Langholff,** treasurer.

J. H. Sanford has been appointed manager of the mining division of the Ohio Brass Company, Mansfield, Ohio. Mr. Sanford assumes the duties of the late John C. Wilson. **Floyd F. Smith,** formerly engineering secretary of the company, has been made assistant to Mr. Sanford in his new position.

Frank Ayer, recently retired as general manager of the Roan Antelope Copper Mines, Ltd., Northern Rhodesia. His successor at Roan Antelope is **R. M. Peterson.** Mr. Ayer is returning to the United States.

—*Obituaries*—

H. M. O'Bleness, executive of the Berwind White Coal Mining Company died at the Mayflower Hotel at Washington, D. C., on January 23, after a brief illness. Funeral services were held in Parkersburg, W. Va.

Mr. O'Bleness was born in Belpre, Ohio, and had a long and distinguished career in the business and professional world. His office was in New York City, but he spent much time in Washington actively cooperating in legislative and other matters affecting the coal industry. The ancestors of Mr. O'Bleness came from Holland in the year 1663 and settled in what is now Harlem, New York City. He was a member of the Holland Society of New York.

Arthur Pellette, age 50, a member of the Board of Directors of the Hecla Mining Company since 1932, died in a hospital in Milwaukee, Wis., in December.

C. C. Mash, resident engineer of the Brookside-Pratt Mining Company, Carbon Hill, Ala., was killed January 4 in a highway accident.

Duncan MacVichie, veteran Utah mining engineer and railroad builder died January 18 at the age of 83 in Salt Lake City. Mr. MacVichie was due to receive the Legion of Honor medal of the American Institute of Mining and Metallurgical Engineers in February. He had been a member of the Institute for 50 years.

He had long been known as a manager of mines and builder of railroads in the intermountain west, and was instrumental in handling many of the details in the construction of the Columbia Steel Corporation plant at Provo, Utah.

Mr. MacVichie was a life member of the American Mining Congress. Made a director of the Utah Chapter at the organization meeting in 1915 he served continuously in that capacity until the time of his death. Other directors of the chapter were honorary pallbearers at his funeral, which took place in the Masonic Temple in Salt Lake City on January 20.

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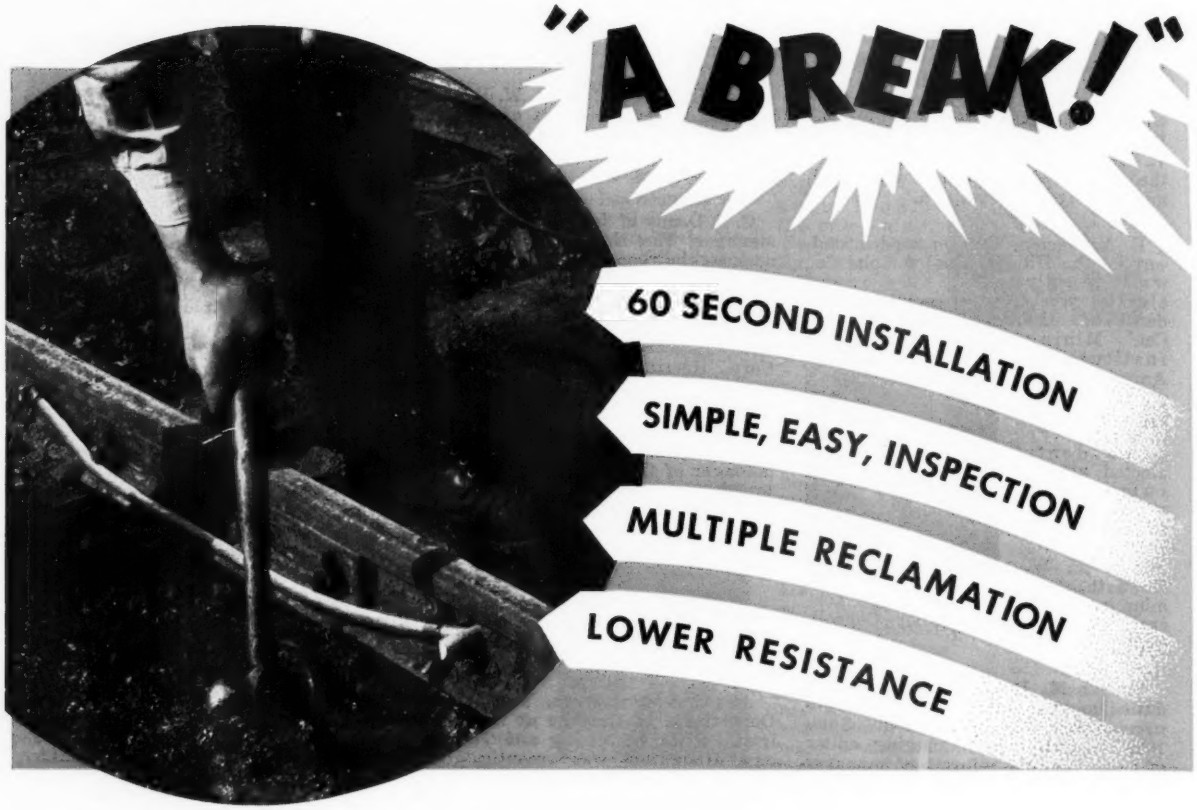

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NEWS and VIEWS

The Silver Market

Supplementing the article, "The Situation in Silver," by Walter E. Trent in this issue, some extracts are of particular interest from the Annual Review of the Silver Market, 1940, issued by Handy and Harman, New York.

The Treasury silver holdings as of December 31, 1939, are given as 2,-931,900,000 ounces.

United States Government acquisitions during 1940 were 203,100,000 ounces, the smallest annual total since the silver buying program was undertaken seven years ago. Of this amount 67,100,000 ounces were derived from domestic ores, and the balance of 136,000,000 ounces represented foreign silver purchased under intergovernment agreements and in the open market, plus some 780,000 ounces received in miscellaneous deposits at the mints and assay offices. The company's estimate of Treasury silver holdings at the end of 1940 is 3,130,-000,000 ounces.

The world silver production for the year is estimated at 278,000,000 ounces, apportioned as follows: United States, 66,000,000 ounces; Mexico, 84,500,000 ounces; Canada, 25,000,000 ounces; South America, 32,500,000 ounces; all other countries, 70,000,000 ounces. Figures for the western hemisphere are reasonably accurate, but the amount of 70,000,000 ounces for the rest of the world is little more than a repetition of the previous year's output. The estimate of 278,-000,000 ounces sets a new high record for production, the former peak of 274,700,000 ounces having been established in 1937.

Of the supplies from sources other than newly mined metal, the largest amount so far as can be ascertained came from China. Official reports from the Chinese Maritime Customs, covering the first 11 months of the year show that over 11,500,000 ounces were exported of which all but a negligible portion went to Burma. It is understood that in addition $1,500,-000, equivalent to about 1,100,000 ounces were released in August from the Chinese Government's silver reserve held at Tientsin in the British and French concessions. This was released by agreement between the British and Chinese Governments for the specific purpose of giving relief to North China flood refugees. For similar purposes the French authorities at Tientsin set aside $2,500,000, but the disposition of this additional amount is unknown.

The estimate for total silver supplies, exclusive of newly mined silver, is 40,400,000 ounces.

The enormous additions to the gold stocks of the United States have prevented any progress for the year towards meeting the provision of the Silver Purchase Act that "one-fourth of the total monetary value of the gold and silver stocks shall be in silver." The percentage of silver to the total has declined during 1940 from about 18 percent to 15½ percent, and, even if not another dollar's worth of gold were added to the 22 billion on hand at the end of 1940, it will be necessary to purchase a further 2,535,000,-000 ounces of silver in order to reach the goal set by the Act.

The amount of silver consumed by the arts and industries in the United States and Canada created a new record for the year 1940. The amount so consumed is estimated at 41,000,000 ounces, an increase of more than 20 percent over the preceding year and nearly 11 percent over 1929 when the previous high of 37,000,000 ounces was established. In the arts the consumption figures showed the following approximate percentage changes compared with 1939: sterling silverware, 30 percent increase; silver-plated ware, 5 percent decrease; jewelry, 10 percent increase; dental trade, 10 percent decrease. There was continued expansion in plating for non-silverware purposes, in the manufacture of electrical contacts and alloys for soldering and brazing, and in the construction of chemical equipment. Also there has been considerable use of silver of various compositions in shipbuilding for the navy and in the production of airplanes, guns and other equipment for national defense.

The Review concludes with the observation that there is nothing to indicate any change in the Government's silver-buying program or in the price which it will pay.

New Tipple

Roberts & Schaefer Company of Chicago, are building under contract a new modern tipple with a capacity of approximately 5,000 tons daily for the Page Coal & Coke Company, Elkhorn, W. Va.

Last Coal Price Lawsuit May Be Cancelled

Officials of the Bituminous Coal Division in Washington have announced the last remaining law suit threatening the Guffey Act soon may be withdrawn. They said that attorneys for the Ayrshire Patoka Collieries Corporation, representing a number of Indiana producers, have stated that they intended to withdraw from the Seventh Federal Circuit Court in Chicago their suit which charged the Government did not follow the letter of the law in establishing minimum mine prices.

Anthracite Fatalities—1940

Anthracite mining fatalities last year totaled 179, or one for each 277,-045 tons output, on the average, compared with 209 fatalities (one for each 245,932 tons production) the previous year. Figures for 1940 are still subject to revision, but even the tonnage per fatality will probably be higher than at any time since the year 1870, according to statistics quoted by the Anthracite Institute.

A total of 64 "bootleg" mine workers were either instantly killed or fatally injured in accidents during the year 1940, which total exceeds by five the death toll in this industry in 1939. In 1938, there were 38 deaths recorded for the industry. In addition to the bootleg mine deaths of which a record could be kept, it is believed that many others died weeks or months after they were injured, since it is known hundreds met with accidents which did not prove immediately fatal. Arranged according to their importance, causes of the 64 deaths in 1940 were: falls of coal and rock; plunges down shafts; hoisting accidents; black damp; exploding gasoline; and miscellaneous.

Mining Associations Meet

Mining associations of the states of Idaho, Colorado and Washington met in January.

The Idaho Mining Association met in Boise on January 24 and 25 for the first time in over two years. Many problems confronting the mining industry were discussed. I. E. Rockwell, of Bellevue, Idaho, is president of the association and James W. Gwinn is secretary.

The 14th Annual Mining Convention of the College of Mines, University of Washington, Seattle, was held during the week from January 20 to January 25. Sessions were held in Mines Laboratory and other buildings on the university campus. The North Pacific Section of the A. I. M. E. met with the Institute at a joint dinner on Tuesday, January 21, and listened to an address on geophysical prospecting by Mr. Sherwin F. Kelly.

In addition to members of the university staff who spoke on pertinent topics, other special speakers were: E. S. Campbell, Seattle, president of the Northwestern Glass Company ("The Glass Industry of the Pacific Northwest"); Frank Eichelberger, Spokane ("Alunite"); S. H. Lorain, Moscow, Idaho, senior mining engineer of the U. S. Bureau of Mines ("Investigations of Strategic Minerals"); E. A. Marble, Tacoma, superintendent

of a Tacoma smelter ("Effect of Impurities on Quality of Refined Copper"); Raymond M. Miller, Portland, industrial engineer of the Bonneville Power Administration ("Electric Smelting in the Pacific Northwest"); Earl K. Nixon, Portland, Director ("The Work of the Oregon Department of Geology and Mineral Industries"); E. N. Patty, Fairbanks, Alaska, mining operator with Canadian Placers, Ltd. ("Gold Dredging Methods in Alaska"); W. W. Spencer, Seattle, mining engineer, Goodnews Bay Mining Company ("Platinum Dredging at Goodnews Bay"); Harry Townsend, Seattle, mining geologist ("Peculiar Prospects"); Samuel H. Williston, Portland, mining geologist ("Quicksilver").

The 44th Annual Convention of the Colorado Mining Association was held at the Shirley Savoy Hotel in Denver, January 24 and 25 in cooperation with the Western Division of the American Mining Congress. Principal speaker at the annual dinner was H. C. Parmelee, editor of *Engineering and Mining Journal*.

Other speakers at the convention included Paul M. Tyler, chief engineer, non-metallics division, U. S. Bureau of Mines; H. Herbert Hughes, chief economist, mineral production, economics division, Washington, D. C.; Carl Zapffe, Minnesota geologist; Burt B. Brewster, Salt Lake mining magazine editor; Walter E. Trent, monetary expert for the Rocky Mountain Metals Foundation, Washington, D. C.; Dr. A. H. Koschmann, U. S. Geological Survey, Washington, D. C.; Frank Lilly, Spokane, Washington; Henry B. Fernald, New York City, and H. W. C. Prommel, Denver.

New Mill in Tri-State

Smoky Hill Mining Company is building a new 200-ton mill on the Quapaw mining lease, north of Commerce, Okla., according to recent advices from that territory.

The mill is of the Joplin type and includes a 16-in. crusher, three jigs, five sets of rolls, and four sludge tables. A flotation plant will be added later.

Some building material and mill equipment was obtained from the old Eunamar mill in Joplin, which was purchased and dismantled by the company. A derrick and hopper is being built over the north shaft on the lease, where mine operations are being carried on at the 289-ft. level by the company.

The company plans later to mine the 335-ft. level, and also is expected to mine those two levels at the east and south shafts on the lease. The mill is expected to be ready for operation the first week in February; prior to that time the company will continue trucking ore for treatment to the Royal custom mill of United Zinc Smelting Corporation.

Associated in the company are Claude Holden, Louis Grimes and Sidney Walker, all of Commerce, and Perry Porter and Lloyd Newton, both of Miami.

Joint Fuel Conference Scheduled for Easton, Pennsylvania

Announcement has been made by L. C. Madeira III, executive director of the Anthracite Institute, that the Fifth Joint Fuel Conference of the American Institute of Mining and Metallurgical Engineers and the American Society of Mechanical Engineers to be held during the fall of 1941 will, for the first time in its history, be held in an anthracite-producing territory.

At the fourth conference, held at Birmingham, Ala., early in November, the conference accepted the invitation issued by Lafayette University to meet in 1941 at Easton, Pa.

New Tennessee Mine Goes Into Production

A new mine of the Pee Wee Coal Company at Garland, Tenn., has gone into production, reports Frank Garland, president. First shipments were made in January.

The mine is equipped with the most modern mechanical mining equipment and a steady production is anticipated from the property.

Western Mineral Exposition Opens

The 2nd Annual Western Mineral Exposition will open February 15, in the State Exposition Building at Exposition Park, Los Angeles, Calif., John Herman, general manager of the exposition, declared in a preliminary statement that the display of rare minerals and metals would be bigger and better than the one at the Golden Gate Exposition and that perhaps more than $150,000 worth of material would be exhibited.

The basement, first and second floors of the Exposition Building are to be occupied by the exhibit and the auditorium will be used for a continuous run of motion pictures, dealing with mines and minerals, from 9.30 a. m. to 10 p. m. every day for a week after the opening. An attendance of 50,000 is anticipated. Harry Hewitt, executive vice president of the exposition, expected to have a genuine Alaskan sourdough take charge of gold panning contests in the basement of the Exposition Building. Bullard's Bar was to be reproduced in a huge concrete tank and anyone desiring to do so could put on rubber boots and pan for gold. Each panner could retain whatever gold he recovered.

Strategic Minerals Reserves Growing

Commitments of the Metals Reserve Company were recently reported upon by Jesse H. Jones, Federal Loan Administrator in a letter to the President and Congress, outlining the activities of the R. F. C. and subsidiaries in connection with the national defense program.

The Metals Reserve Company was created by the Reconstruction Finance Corporation in June 1940, with a capital of $5,000,000 to acquire a supply of critical and strategic minerals. Purchases of such materials are in excess of current requirements. The state of advancement of this program is contained in the accompanying table:

Free Coal for Needy Families

A plan has been completed by Smoke Commissioner R. R. Tucker and James L. Ford, Jr., chairman of the Smoke Elimination Committee of St. Louis in cooperation with the operators in the Arkansas-Oklahoma coal fields, for the distribution of 1,000 tons of Arkansas-Oklahoma coal to needy families in St. Louis. The coal will be a donation from the Arkansas-Oklahoma operators and will be distributed to families not on regular relief rolls, but those that are borderline cases and definitely in need of assistance. The Frisco Railroad will haul the coal to St. Louis free of charge.

Ore Found in Elton Tunnel

In driving the Elton tunnel, Utah, a small piece of drag ore containing good lead-zinc values was found at the face, at a distance of 21,188 feet from the portal. Further discoveries are expected as the tunnel advances and developments are being watched with interest.

'Low-down' Singing

Broadcasting studios and mine stopes ordinarily do not have much in common. But the two were combined to good effect on Christmas Eve when carols were broadcast from the 2,400 foot level of the Idaho-Maryland Mine at Grass Valley, Calif. The California Cornish Mining Singers and the Grass Valley Carol Choir participated in the half-hour program which was aired by the National Broadcasting Company. The singers were no doubt less surprised at finding themselves so far underground than were the studio technicians. The mining industry might reciprocate by giving a demonstration of blasting or mining methods in the N. B. C. studios in New York.

	Tons On Hand	Tons Afloat	Tons On Order	Amount
Antimony:				
Chinese	2,352	3,898	....	$1,750,000
Domestic	....	....	3,000	780,000
Chrome ore:				
South African	....	....	100,000	2,140,000
Philippine	....	....	100,000	1,800,000
Copper:				
Latin American	....	....	100,000	22,400,000
Graphite:				
Madagascar	411	....	....	35,200
Manganese ore:				
Far Eastern	34,237	54,860	447,040	15,434,000
Latin American	1,943	....	276,000	9,254,000
Domestic	....	....	1,335,000	46,256,000
Tungsten Trioxide:				
Domestic	....	....	1,250	2,875,000
Tin:				
Far Eastern	13,985	6,720	54,295*	84,000,000
Bolivian	....	....	90,000	100,000,000
Antimony, wolframite and tin—Chinese (respective quantities undetermined)				90,000,000
				$376,724,200

* Includes 40,070 tons for which purchase contract is not yet executed.

Signs of the Times

An extensive plan for improvement and expansion has been announced by the Republic Steel Corporation for its Witherbee-Sherman mines, Mineville, N. Y., and Chateaugay mine, Lyon Mountain, N. Y. A new hoist will be installed at the Witherbee-Sherman properties and the underground workings in the Old Bed and Harmony mines will eventually be connected. The capacity of the Chateaugay mine will be increased about 15 percent ◆▶ 18 Marcy ball mills are being purchased by the Phelps Dodge Corporation from the Mine and Smelter Supply Company for a sum in excess of a third of a million dollars. The mills will be installed in the new concentrator at Morenci, Arizona. Each mill is calculated to grind from 1,500 to 1,650 tons daily and 16 of the mills will be sufficient to keep the 25,000-ton concentrator busy ◆▶ Construction will begin soon on a large electrolytic zinc refining plant in Texas. The plant is being built by the American Smelting & Refining Company and will have a capacity of 2,000 to 2,500 tons of zinc per month. The company is also increasing its zinc smelting facilities at Amarillo, Texas. $200,000 will be spent to restore three furnaces, each with a monthly capacity of 800 tons. When the work is completed in March the Amarillo plant will have a capacity of 7,000 tons of zinc per month.

Mines in the Placerville area in San Miguel county, Colorado, will be reopened by the Vanadium Corporation of America, to produce roscoelite ore for vanadium content. The company's mill in Naturita in Mount Rose county, Colorado, will be used to concentrate the ore ◆▶ Construction of new by-product coke capacity is now under way. It is estimated that new capacity for approximately three million to four million tons will be in production by the end of the current year and that this output will gradually become available beginning in the next few months ◆▶ The Schley iron mine at Gilbert, Minnesota, Mesabi range, will soon be reopened and operated by the North Range Mining Company of Negaunee, Michigan, through a working arrangement with the E. W. Coons Company, Inc., of Hibbing. The mine has been inactive since 1923 ◆▶ A new anthracite coal cleaning plant is now being built at Swoyersville, Pa., for the Harry E. Coal Company, West Pittston, Pa. A contract has been placed for three 12-foot and one 10-foot Koppers Menzies Cone Separators, to the Koppers-Rheolaveur Co., for incorporation in the plant ◆▶ At least four companies in the Birmingham, Alabama, district are enlarging their coke-making capacity. The Sloss-Sheffield Steel and Iron Company is adding 100,000 tons annually to its foundry coke capacity by restoring to operation 87 beehive-type ovens idle since the World War. The Tennessee Coal, Iron and Railroad Company is adding 400,000 tons annually to its capacity as a part of its $30,000,000 expansion program. Ovens at Holt, Alabama, which will produce 180,000 tons annually are being rehabilitated by the DeBardeleben Company. The Alabama By-Products Corporation is installing new ovens to produce 100,000 tons annually.

Final report for the 1940 navigation season established that a greater amount of bituminous coal was moved on the Great Lakes in that year than for any previous annual period, including the peak year of 1936. From the opening of the season to December 31, bituminous coal loaded into vessels at Lake Erie ports, including both cargo and fuel coal amounted to 48,111,191 net tons. This exceeded by 17 percent the total coal movement for the year 1939 of 41,123,608 tons.

Blast furnaces at National Steel Corporation plants at Detroit and Buffalo are to be rebuilt and enlarged. Construction has been authorized for a new blast furnace and additional coke ovens to add approximately 300,000 tons to the annual pig iron capacity of the Weirton Steel Company, a subsidiary of National Steel Corporation. The improvements at the three plants will cost about $15,000,000 and will increase the annual pig iron capacity of the National Steel Corporation by approximately 700,000 tons annually ◆▶ The Southeastern Missouri lead producing district yielded 169,500 tons of recoverable lead in 1940, which was the highest output since 1930, and compared with 153,522 tons in 1939 ◆▶ At least 60 beehive coke ovens, idle for the past 10 years, will be reopened by the Old Cherry Valley Iron Company at Leetonia, Ohio. Domestic and industrial coke will be produced.

The National Defense Commission has approved a plant expansion program to cost six and a half million dollars for the Los Gatos, California, plant of the Permanento Cement Corporation. At the plant Nevada magnesium ore will be used for the production of metallic magnesium. Included will be facilities for making magnesium castings ◆▶ The total steel ingot production for 1940 is estimated at 65,246,953 net tons, according to the American Iron and Steel Institute. This represents a big jump in production from the year 1939 when 51,584,986 tons were produced. The average rate of operation during 1940 was 82.22 percent of capacity as against 64.7 percent in 1939. It is expected that steel ingot production in 1941 will exceed 80,000,000 tons ◆▶ From 900 to 1,000 tons of bituminous coal will be consumed per day in the coke ovens and boiler house of the anhydrous ammonia plant to be built at Morgantown, W. Va., by the du-Pont Company, in cooperation with the Ordnance Department of the U. S. Army.

For the calendar year to the end of November, 1940, Utah bituminous coal production was 3,082,000 tons compared with 2,002,000 tons for the same period in 1939 ◆▶ Two anthracite mines near Lansford, Pa., may be reopened after a 12-year shutdown. The mines are Nos. 4 and 5 of the Lehigh Navigation Coal Co., and more than $300,000 may be spent in pumping the mines and putting them into workable condition ◆▶ A new ore conditioning and sintering plant has been completed for the Red Mountain iron mines near Birmingham, Ala., to handle the iron ore of the Tennessee Coal, Iron and Railroad Company in that district. The plant is located at the Wenonah mine division and at No. 7 slope or inclined entry. This plant is one of the outstanding metal mining projects of 1940.

Equipment purchases of American railways, according to *Railway Age*, amounted to $233,374,000 in 1940. This compared with $188,838,000 in 1939 and $74,006,000 in 1938. The annual average for the decade beginning with 1930 was $94,513,000 ◆▶ The Louisville and Nashville Railroad billed over six million net tons of bituminous coal to the Great Lakes for the 1940 season to the end of November. This was almost a million tons more than the amount billed in 1939 ◆▶ The Wieman and Ward Company of Pittsburgh, Pa., are rehabilitating the Dearth coke plant in the Connellsville district, which has been inactive for many months. When fully modernized the property will have an annual capacity of 200,000 tons of low phosphorous, low sulphur beehive coke ◆▶ The No. 3 Blast Furnace at the Clairton, Pa., works of the Carnegie-Illinois Steel Corporation will be repaired and is expected to be in blast about the first of May. This furnace was last operated in 1930. When in blast it will add an additional pig iron production of 200,000 net tons to the total capacity of the district.

Research on Coals Progressing

In 1939 the General Assembly of Pennsylvania made available for research on anthracite and bituminous coal a fund of $35,000 to be used during the biennium ending June, 1941, and contingent upon the provision by the coal industry of a like amount. This provision was quickly met by the operators in the anthracite and bituminous coal industries and research projects were actively under way in October, 1939, at the Experiment Station of the School of Mineral Industries of Pennsylvania State College.

After a consideration of many problems awaiting solution, the Anthracite Committee and the Bituminous Coal Committee engaged upon this project each selected two specific problems for research. For the anthracite industry the projects were: (1) A study of the generation of water gas from anthracite with particular attention to the physics and chemistry of the reactions, improvements in operating conditions, efficiency and design of generating equipment, (2) A study of the production of carbon products with special attention to the use of anthracite for active carbon production. Research on bituminous coal was directed into two channels, (1) Comfort heating with Pennsylvania bituminous coal with special attention to elimination of coke-tree formation and to automatic ash removal. (2) Development of "coal solutions" and study of possible industrial uses.

This work is not yet complete but D. C. Wright, associate professor of fuel technology at Pennsylvania State College reports in Mineral Industries, the publication of the college, that the laboratory work is already having conclusive results. Studies have been completed on anthracite from all the major anthracite mining districts to determine the properties which are of particular interest in the manufacture of water gas. Two continuous-process activation furnaces each capable of producing approximately one-half pound per hour of active carbon have been constructed and a variety of experiments performed with interesting results.

In the field of comfort heating one of the most completely equipped staff organizations in the country has been gathered for study on comfort heating with bituminous coal, and tests have been completed on the use of a wide variety of Pennsylvania bituminous coal in various types of stokers. Also, development work has progressed on a stoker to burn strongly coking coals without coke-tree formation and has resulted in the successful development of a unit which handles satisfactorily all the Pennsylvania coals thus far investigated. The suitability of any given coal for use in specific types of burning equipment has been given attention in the laboratory studies. In this connection, the swelling properties of bituminous coal have been investigated.

The oxidation and solution of bituminous coals have been investigated with the object of determining the most satisfactory oxidation and solution conditions and possible uses for the product. Solution experiments have included a study of solvent methods of treatment and recovery of solvent and of products.

The entire program is progressing favorably.

Tin Smelter at Baltimore?

The question of a government-financed tin smelter in the United States to treat foreign ores is reaching the decision point. The field of prospective operators for the plant has narrowed down to Phelps Dodge Corporation, American Metals Company, Van der Broek of the Dutch Billiton Company and the Arnheim Smelter of Holland.

Various locations have been considered for the smelter, in New Jersey or at Houston, Tex. It is reported that Baltimore is being considered as a likely location.

Aside from these plans for domestic smelting the Reserve Metals Corporation, it was recently stated, has 15,500 tons of tin for stockpile, another 9,500 tons en route, and 15,000 tons purchased and awaiting ships at loading ports.

Callahan Zinc-Lead Builds Mill in Arizona

The Callahan Zinc-Lead Mining Company has purchased the Duquesne mine in the Patagonia district of Arizona and has constructed a 100-ton flotation mill at the property to treat the silver, lead, zinc and copper ores of the mine.

Leaching Plants to Be Built

A 300-ton leaching plant is being constructed by the Emerald Isle Copper Company near Chloride, Ariz., for the production of 12,000 pounds of copper daily, according to Ogden C. Chase, president and general manager, Las Vegas, Nev. Mr. Chase stated that copper will be produced in the form of precipitates on scrap iron, and that the company is now installing a smelting plant to melt the precipitates into copper matte.

The company controls about 200 acres of ground near Chloride, which is underlaid by copper-bearing conglomerate said to be from 60 to 100 feet thick under an overburden about 10 feet thick. Tests of the ore, it is reported, indicates that the copper content of the conglomerate is 2.28 percent to as high as 11 percent.

MINE PRODUCTION OF GOLD IN THE UNITED STATES, 1939–40, BY STATES, IN TERMS OF RECOVERABLE METAL

State or Territory	Fine ounces 1939	Fine ounces 1940 *	Increase or decrease in 1940 Fine ozs.	Increase or decrease in 1940 Pct.	Value (at $35 per ounce) 1939	Value (at $35 per ounce) 1940 *
Western States and Alaska:						
Alaska	676,737	765,200	+88,463	+13	$23,685,795	$26,782,000
Arizona	316,453	292,500	—23,953	— 8	11,075,855	10,237,500
California	1,435,264	1,408,700	—26,564	— 2	50,234,240	49,304,500
Colorado	366,852	368,798	+ 1,946	+ 1	12,839,820	12,907,930
Idaho	116,662	145,000	+28,338	+24	4,083,170	5,075,000
Montana	264,173	275,700	+11,527	+ 4	9,246,055	9,649,500
Nevada	361,518	367,400	+ 5,882	+ 2	12,653,130	12,859,000
New Mexico	36,979	39,374	+ 2,395	+ 6	1,294,265	1,378,090
Oregon	93,372	112,700	+19,328	+21	3,268,020	3,944,500
South Dakota	618,536	592,936	—25,600	— 4	21,648,760	20,752,760
Texas	324	340	+ 16	+ 5	11,340	11,900
Utah	277,751	352,770	+75,019	+27	9,721,285	12,346,950
Washington	90,420	84,665	— 5,755	— 6	3,164,700	2,963,275
Wyoming	583	768	+ 185	+32	20,405	26,880
	4,655,624	4,806,851	+151,227	+ 3	$162,946,840	$168,239,785
Eastern States:						
Alabama	3	5	+2	+67	$105	$175
Georgia	670	900	+230	+34	23,450	31,500
Maryland	71	.....	—71	—100	2,485	.....
North Carolina	495	1,965	+1,470	+297	17,325	68,775
Pennsylvania	1,815	1,800	—15	— 1	63,525	63,000
South Carolina	13,833	12,960	—873	— 6	484,155	453,600
Tennessee	163	190	+27	+17	5,705	6,650
Virginia	364	480	+116	+32	12,740	16,800
	17,414	18,300	+886	+ 5	$609,490	$640,500
Central States:						
Indiana	4	5	+1	+25	140	175
Philippine Islands	† 999,408	† 1,079,896	+80,488	+ 8	† $34,979,280	† $37,796,360
Puerto Rico	† 35	.....	—35	—100	† 1,225	.....
	999,443	1,079,896	+80,453	+ 8	$34,980,505	$37,796,360
Total	5,672,485	5,905,052	+232,567	+ 4	$198,536,975	$206,676,820

* Preliminary figures. † Refinery receipts.

Chart from U. S. Bureau of Mines.

Gold Production of U. S.—1940

A preliminary report issued by the United States Bureau of Mines states that total mine production of recoverable gold in the United States (Territories included) was 5,905,052 fine ounces in 1940, an increase of 4 percent over 5,672,485 ounces in 1939, according to preliminary figures of the Denver office of the Bureau. The value of the gold calculated at $35 per fine ounce was $206,676,820 in 1940 and $198,536,975 in 1939. Of the total production in 1940, California contributed 24 percent, Philippine Islands 18 percent, Alaska 13 percent, South Dakota 10 percent, Colorado 6 percent, Nevada 6 percent, Utah 6 percent, Arizona 5 percent, Montana 5 percent, and other states 7 percent.

The above summary for 1940 has been abstracted from preliminary state reports and other information compiled by the western offices of the Bureau of Mines. More detailed individual state reviews are available upon request to the Bureau of Mines, Washington, D. C.

Alaska May Be Source of Tin

Several sections of the Seward Peninsula, Alaska, are known to contain tin. Limited production was made last year by the American Tin Fields at Cape Prince of Wales, but extensive prospecting has been prohibited by high cost of the work. This locality had a brief flurry of activity in 1903 and has since been idle.

Dr. J. B. Mertie, Jr., headed a U. S. Geological Survey party in investigating tin deposits last summer at Lost River, about 20 miles south of Cape Prince of Wales. In the Buck Creek section, near Potato Mountain, east of Cape Prince of Wales, are two abandoned dredges that operated in 1918 and 1919.

Recently Alfred Lomen, Jr., of Nome, a member of the Lomen family, widely known in the north, returned from a prospecting trip to the Ear Mountain section 25 miles south of Shishmaref. Lomen flew into the prospect accompanied by John Read and obtained samples to be assayed at Fairbanks.

Mr. Lomen has high hopes for the future development of the district.

Railroad Rates Attacked

Twenty producers and shippers of Pennsylvania hard coal have filed complaints with the Interstate Commerce Commission and the Pennsylvania Public Utility Commission attacking freight rates charged by more than 70 railroads of the United States and Canada. The action has been described as one of the most sweeping attacks upon the freight rates structure in the history of the industry. Dates for hearings have not yet been set.

Assessment Work Suspended During Military Service

Announcement was made by Secretary Ickes, Department of the Interior, recently that holders of mining claims who were in military service on October 17 or enter at later date will not be required to perform the usual $100 worth of assessment work during their service.

Regulations issued by Secretary Ickes also permit time in military service to be credited for residence and cultivation of land under the homestead laws, suspending payments which fall due during the period of military training.

Those desiring suspension of assessment work on mining claims will be required to file notice in the county office where their certificates are recorded, before the end of the assessment year, which will be July 1, 1941.

Philippine Mines Maintain Production

Reporting on mine production of the Philippine Islands, W. F. Boericke, valuation engineer of the Bureau of Mines (P. I.), says that the mining industry has been the brightest spot in an otherwise drab year for agriculture and practically all other industries in the Islands. With the European conflict involving practically every country on the Continent and removing many markets for Philippine exports, the prices for such commodities as sugar, cocoanut oil, abaca and copra, the four great money crops of the Commonwealth, have sunk to generally unprofitable levels.

Restrictions on shipping, with a considerable increase in freight rates, have cut deeply into the slender profits of producers and caused a notable slowing down in trade and in government revenues. Mining alone has continued to maintain a profitable trend, and at the end of the year new production records have appeared for the five principal mining industries—gold, copper, iron, chrome and manganese.

As in former years gold mining leads all others in the value of its output. For the year just ended gold production will top $39,000,000, and final figures may be found close to $40,000,000 in value. This represents about 11 percent increase over the 1939 production, which was $36,087,000 according to figures of the Chamber of Commerce. There are some 40 producing gold mines and a gratifying large number are paying more or less regular dividends. It is reported that during the month of December no less than 17 mining companies declared dividend payments.

The two principal copper mines in the Philippines continued to expand their output, and it is estimated that their joint production will exceed 15,000,000 pounds of copper. The larger of these mines, Lepanto Consolidated, one of the notable copper producers of the Far East, mined ore averaging over 4 percent copper during the year with a gold and silver content of about $6.50 a ton. All the concentrates from this mine have been sent to Japan to date, but a smelter has just been completed which will permit shipment of pig copper direct to the United States if necessary to do so. This is the first copper smelter to be erected in the Philippines.

Iron mining continued to engage thousand of workers with an output for the year estimated at over a million tons of high grade ore. Like copper, all of the Philippine iron ore is exported to Japan, the only available market. Undoubtedly the output could have been expanded considerably if freighters had been available, but lack of bottoms made shipments irregular. No further work was done on the Government-owned iron deposit at Surigao, which is estimated to contain upwards of 500,000,000 tons.

The war has made far-reaching changes for chromite and manganese mines of the Philippines. Formerly these mines shipped their products to Japan, to Germany and to other European countries besides the United States. In 1938 practically the entire Philippine manganese production went to Japan. With the creation of the War Industries Board to set up stockpiles of strategic minerals within the United States the mining of chromite and manganese has been stimulated in the Philippines to no small degree, and if ships had been available it seems certain that production would have been considerably larger.

During the first nine months of the year shipments of chromite ore from the Philippines are officially reported to have been 118,974 metric tons, as compared with 132,177 tons for the whole year of 1939, all of which was exported to America. Manganese ore shipments for the same period were 38,763 metric tons, but actual production is believed to have been much larger. Practically all of this ore went to the United States. Prices for both chrome and manganese ore advanced considerably during the year, and one important manganese producer has erected two large mills for beneficiation of its low-grade ores. The future outlook for both chrome and manganese in the Philippines is considered promising.

Despite the continued increase in gold production in the Philippines, there is reason to believe that temporarily at any rate, the peak of production has been seen. During the year there were practically no new capital issues offered for prospecting and developing potential gold mines.

During the year only two new mines of major importance started to produce, and these two had been under development before the start of the war in 1939. Furthermore, mill capacity of the larger properties has now been expanded to what appears to be the economic limit, and further increases are unlikely with a few exceptions.

The attitude of the Philippine Government authorities toward the gold mining industry has been distinctly conciliatory, but there has been some labor agitation which appears to be unjustified.

Metallurgists Needed in Government Service

The United States Civil Service Commission has announced that it will again receive applications for positions of metallurgist and metallurgical engineer, various grades, with salaries ranging from $5,600 to $3,200 a year. An insufficient number of eligibles for filling these positions resulted from the examination which closed in September 1940. Difficulty is being encountered in filling positions in the Bureau of Mines in connection with the national defense program for the development of strategic metals. Qualified persons are urged to send their applications to the Commission's Washington office at once where they will be rated as received until December 31, 1941.

Applicants will not be given a written test. They will be rated on their educational training and experience. A four-year college course with major study in chemistry, geology, mining, physics, engineering, or metallurgy is required plus responsible experience in metallurgy or metallurgical engineering. For the associate grade, appropriate graduate study may be substituted for the entire experience requirement; for the other grades, a partial substitution may be made. In each case, the graduate study must have specific value in the branch of metallurgy or metallurgical engineering in which the applicant wishes to be rated.

Applicants must not have passed their sixtieth birthday on the date of receipt of application. The salaries for all grades are subject to a 3½ percent deduction toward a retirement annuity.

Further information regarding the examination and the proper application forms may be obtained from the Secretary of the Board of U. S. Civil Service Examiners at any first- or second-class post office, or from the United States Civil Service Commission, Washington, D. C.

Koppers Coal Company Acquires Additional Mine

Koppers Coal Company has purchased two mines of the Sonman Shaft Coal Company, Philadelphia, which were formerly operated under sub-lease, near Portage, Pa. The company announced that the Sonman Company would be dissolved and the mines would be operated directly. Also it was said that extensive improvements would be made, including the installation of mechanical equipment. The Sonman slope mine has been turning out approximately 1,000,000 tons of soft coal annually.

Bauxite Mining Corporation Formed

The Bauxite Mining Corporation, a subsidiary of the Reynolds Metal Co., has been formed to engage in prospecting for and mining bauxite, from which aluminum is produced. The new company already has prospectors in the field in the state of Arkansas. The new aluminum reduction plant of the Reynolds Metal Co., located at Lisker, Ala., will be in production this spring.

New Mill in Colorado

A concentrating plant is being built near Montezuma, Colo., by the Western Mines, Inc., owner of the Plymouth Milling Company. It is expected that the mill will be completed and in operation in March of this year. Flotation and smelter equipment will have a capacity of 250 tons a day and operations will be started on the basis of 75 to 100 tons per day, later increasing to full capacity.

President of the Western Mines Company is C. B. Van Deman, Colorado Springs. The company also operates in the Cripple Creek district.

43rd Annual Meeting

(*Continued from page 75*)

At a meeting of the Board of Directors, officers for the ensuing year were elected, as follows: President, Howard I. Young; vice presidents, D. D. Moffat, vice president Utah Copper Company, Salt Lake City, Utah; E. B. Greene, president, Cleveland - Cliffs Iron Company, Cleveland, Ohio; and Donald A. Callahan, Lexington Mining Company, Wallace, Idaho; and secretary, Julian D. Conover, Washington, D. C.

The big gala social affair of the day was a buffet supper and dance in the Chinese Room and the ballroom of the Mayflower starting at 6:30 p. m. Over 300 members and distinguished guests including members of Congress from many mining states, with their wives, were present. Liquid refreshments and supper were served, following which everyone had a good time dancing and visiting until 10:30 p. m.

The board also appointed an Advisory Council of the Coal Division for the ensuing year.

Chairman: R. L. Ireland, Jr., president, Hanna Coal Co., Cleveland, Ohio.

C. E. Abbott, vice president, Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

C. A. Garner, vice president, Jeddo-Highland Coal Co., Jeddo, Pa.

T. G. Gerow, vice president, Truax-Traer Coal Co., Chicago, Ill.

C. A. Gibbons, general manager, Susquehanna Collieries Co., Nanticoke, Pa.

Geo. B. Harrington, president, Chicago, Wilmington & Franklin Coal Co., Chicago, Ill.

Moroni Heiner, president, Utah Fuel Co., Salt Lake City, Utah.

E. P. Humphrey, vice president, Stonega Coke & Coal Co., Philadelphia, Pa.

W. J. Jenkins, president, Consolidated Coal Co., St. Louis, Mo.

S. B. Johnson, president, Lorain Coal & Dock Co., Columbus, Ohio.

L. Russell Kelce, vice president, Hume-Sinclair Coal Mining Co., Kansas City, Mo.

Frank F. Kolbe, president, United Electric Coal Companies, Chicago, Ill.

Eugene McAuliffe, president, Union Pacific Coal Co., Omaha, Nebr.

Harry M. Moses, president, H. C. Frick Coke Co., Pittsburgh, Pa.

A. J. Musser, vice president, Clearfield Bituminous Coal Corp., Indiana, Pa.

E. J. Newbaker, vice president, The Berwind-White Coal Mining Co., Windber, Pa.

E. R. Price, superintendent, Inland Steel Co., Wheelwright, Ky.

R. E. Salvati, vice president, Island Creek Coal Co., Holden, W. Va.

Henry P. Smith, president, Princeton Mining Co., Terre Haute, Ind.

J. Noble Snider, vice president, Consolidation Coal Co., New York City.

K. A. Spencer, vice president, Pittsburg & Midway Coal Mining Co., Kansas City, Mo.

D. R. Swem, manager of coal operations, Northwestern Improvement Co., Seattle, Wash.

R. E. Taggart, president, Philadelphia & Reading Coal & Iron Co., Philadelphia, Pa.

T. J. Thomas, president, Valier Coal Co., Chicago, Ill.

L. E. Young, mining engineer, Pittsburgh, Pa.

Anaconda to Purchase Copper Canyon Mine

International Smelting & Refining Co., a subsidiary of Anaconda Copper Mining Co., has obtained an option to purchase 2,000,000 shares of the stock of the Copper Canyon Mining Co. for 25 cents a share. The par value is 10 cents. In the meantime the optionee will proceed with an examination and exploration of the Copper Canyon properties, which consist of two groups at Battle Mountain, in Lander County, Nev. The negotiations were conducted on behalf of the International Smelting & Refining Co. by William Braden.

The authorized capital of the Copper Canyon Mining Co. has been reduced from $700,000 to $500,000 recently. This was accomplished by eliminating the 100,000 shares of preferred stock of $4 par, and increasing the 3,000,000 common to 5,000,000 par 10 cents.

Arthur A. Aaron is vice president, L. E. Wicher is treasurer, and S. L. Sherman is secretary of the Copper Canyon Mining Co., and these officers, with Arthur Notman and W. A. Paine, Jr., compose the board of directors.

This company was organized in 1916 to take over the properties of the Glasgow & Western Exploration Co. The purchase price, it is said, was paid out of the first year's production.

A.I.M.E. Section Elects Officers

At a recent meeting of the San Francisco Section of the A. I. M. E. officers for 1941 were elected as follows: Walter S. Weeks, chairman; Henry W. Gould, vice chairman; Gordon I. Gould, secretary-treasurer; executive committee, Robert Hawxhurst, Jr., Charles White Merrill, Henry C. Carlisle and W. Sprott Boyd. H. A. Sawin is the retiring secretary.

PUBLICATIONS OF INTEREST

U. S. BUREAU OF MINES

R. I. 3537. ANNUAL REPORT OF THE EXPLOSIVES DIVISION, FISCAL YEAR 1940, by Wilbert J. Huff. 38 pp.

R. I. 3539. SHRINKAGE OF COKE, by H. S. Auvil, J. D. Davis, and J. T. McCartney. 16 pp. and numerous charts and illustrations.

I. C. 7143. ANNUAL REPORT OF RESEARCH AND TECHNOLOGIC WORK ON COAL, FISCAL YEAR 1940, by Arno C. Fieldner and W. E. Rice. 50 pp.

MINERAL TRADE NOTES, a monthly inventory from the Economics and Statistics Branch of the Bureau of Information compiled from U. S. Government Foreign Service office reports and other sources. Vol 12, No. 1, published January, 1941. 22 pp.

INTERNATIONAL COAL TRADE, a monthly inventory from the Economics and Statistics Branch of the Bureau compiled from U. S. Government Foreign Service office reports and other sources. 10 pp.

U. S. GEOLOGICAL SURVEY

Bull. 902. THE BROWN IRON ORES OF EASTERN TEXAS, by Edwin B. Eckel. 153 pp. and maps.

Bull. 922-I. ANTIMONY DEPOSITS OF A PART OF THE YELLOW PINE DISTRICT, VALLEY COUNTY, IDAHO. A preliminary report by Donald E. White. 32 pp. and a map.

Bull. 922-M. TIN DEPOSITS OF THE BLACK RANGE, CATRON AND SIERRA COUNTIES, N. MEX. A preliminary report by Carl Fries, Jr. 15 pp. and map.

Bull. 922-K. ANTIMONY DEPOSITS OF THE WILDROSE CANYON AREA, INYO COUNTY, CALIF., by Donald E. White. 18 pp. and maps.

Bull. 900-E. SUBSURFACE GEOLOGY AND OIL AND GAS RESOURCES OF OSAGE COUNTY, OKLA. Part V. Townships 26 and 27 North Ranges, 10 and 11 East, by L. E. Kennedy, W. E. Shamblin, Otto Leatherock, and N. W. Bass. 35 pp. and maps.

Bull. 922-H. TUNGSTEN DEPOSITS OF THE ATOLIA DISTRICT, SAN BERNARDINO AND KERN COUNTIES, CALIF., by Dwight M. Lemon and John V. N. Dorr II. 40 pp. and maps.

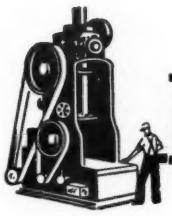
MISCELLANEOUS

A.S.T.M. STANDARDS ON COAL AND COKE, prepared by the Committee on Coal and Coke of the American Society for Testing Materials. Has sections on Sampling Method, Chemical Analysis, Methods of Testing, Specifications and Classifications, and Definitions of Terms. Published December, 1940. 135 pp. $1.25.

ANNUAL REPORT OF THE SECRETARY OF THE INTERIOR FOR THE FISCAL YEAR ENDED JUNE 30, 1940. Published by the United States Government Printing Office. 27 pp.

A DIRECTORY OF STATE, TERRITORIAL AND REGIONAL PLANNING AGENCIES AND STATE DEFENSE AGENCIES. Circular II (Revised) from the Executive Office of the President, National Resources Planning Board, Washington, D. C. A compilation, giving personnel of the various agencies. 39 pp.

A REVIEW OF THE ZINC INDUSTRY IN 1940, by Ernest V. Gent, Secretary, American Zinc Institute, Inc., 60 East 42nd St., New York City. 13 pp.

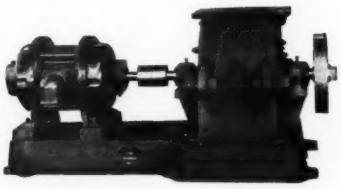


MANUFACTURERS' Forum

A Sample Crusher

Today most coal is bought on specifications and a thorough knowledge of the product is required by the purchaser as well as the producer.

Here is a good small crushing unit for preparing coal samples for the laboratory. It is a compact unit re-



quiring no more space than the ordinary office desk, but has a high capacity so that the chemist may run his tests quickly. It is capable of reducing a four (4) inch lump to minus eight (8) mesh and finer in one pass. It is a very handy unit to have around the plant.

Complete information will be furnished on request to the American Pulverizer Company, 1249 Macklind Ave., St. Louis, Mo.

Link-Belt Speeder Announces Light Weight 3-4 yd. Convertible Shovel

A new, lightweight ¾-yd. convertible shovel-dragline-crane, Model 75, is announced by Link-Belt Speeder Corp., 301 W. Pershing Road, Chicago, as a companion to its popular LS-85 heavy-duty ¾-yd. machine.

All-welded steel construction has replaced castings in the new "75." The

power plant is a heavy-duty gasoline or Diesel engine with smooth-running roller chain drive. Alloy steel, machine-cut spur gears drive the reverse and drum shafts. These turn in heavy bronze bearings.

A large-diameter turntable and long, wide crawlers give the Model "75" extra stability on slopes and in heavy digging. The turntable is made of alloy steel with internal gear. A roller path machined on a bevel permits the use of large, wide-faced conical rollers that revolve without slippage. Upper and lower frames are connected by a heavy alloy steel center quill with large adjusting nut.

A three-piece traction shaft driven by fully enclosed alloy steel bevel gears transmits full power to the crawlers by means of heavy, heat-treated roller chains.

Crawler shoes are abrasion-resisting, non-clogging, lug driven, with close pin centers to insure smooth action. Added stability results from using double-faced track rollers, increasing the effective crawler width. Track adjustment is provided at both ends to maintain perfect alignment and tension.

Controls operated from within the cab permit steering in both directions, either gradual or sharp, regardless of the relative position of cab and lower base. A positive traction lock, controlled from the cab and engaging in three positions, prevents movement of the crawlers while working, eliminating any necessity for chocks or blocking.

Working ranges, clearances and lifting capacities are given in a new folder sent upon request. Reader can get a copy by referring to Model "75" and addressing the manufacturer or his nearest distributor.

New Light "Multi-Vane" Grinder (Size 00)

Ingersoll-Rand Company has recently added a new "baby" air grinder to its line of pneumatic tools.

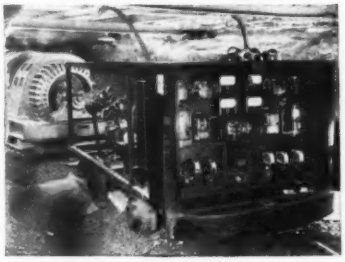
This tool, called the Size 00, weighs only 1¼ lbs. and operates at 20,000 r.p.m. at 90 lbs. pressure. It is built to take 1½" diameter Organic Bonded or 1¼" diameter Vitrified Wheels. Also available are various sizes of collets to take mandrel mounted Grinding Wheels or small Twist Drills.

Although originally intended to be used as a die grinder for tool room and bench work, it is now being used by industry at large for innumerable light grinding jobs wherever metal must be removed from places that would otherwise be hard to reach.

For further details address all communications to Ingersoll-Rand Company, 11 Broadway, New York.

New Mining Switchgear Can Be Portable

New unitized automatic switchgear, for controlling synchronous-motor-generator substations in mining service, is announced by the Westinghouse Electric & Manufacturing Company. This new equipment can be arranged

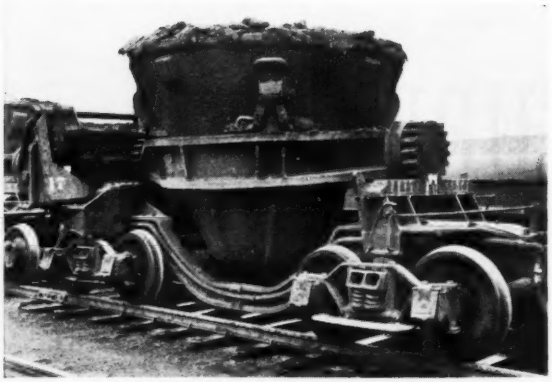


for mounting on a portable truck or car so that it may be moved right along with the load center. Such portability reduces installation costs by requiring less length of distribution feeders; it also results in less voltage variation at the load. Available for standard operation from a 2,300-volt, 60-cycle a-c supply, and with a 275-volt d-c output, it can also be obtained for other standard voltages.

The switchgear provides for the starting, stopping and running of the motor-generator set. The operation of the switch or push button is the only manual one required. Starting and stopping sequences are fully automatic and are accomplished by means of control relays on the switchgear itself. Complete protection against overload, short circuit, faulty equipment and improper running conditions, is provided during the full operating cycle of the system. Lighting protection and bearing temperature relays are available as optional protective equipment.

This switchgear is available for controlling both single and double unit substations. Optional on the double unit systems is a "load responsive" feature which automatically starts and stops both units in response to load demand. Provision is included for manually shifting the load responsive equipment so that either unit may be the "lead-off" machine.

Further information on this new automatic switchgear may be obtained from department 7-N-20, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.



Bethlehem Brings Out Heavy Duty Steel Ties

The Anchor tie, a new H-beam tie for use in mine and industrial tracks, of simple design, having only four loose parts, has recently been developed by Bethlehem Steel Company, Bethlehem, Pa. (U. S. Patent No. 2,224,731). The gage of the track is definitely fixed at the place of manufacture by two double shouldered ⅜-in. tie plates, 5½ in. wide, arc welded to the 6-in. H-beam which is 8 ft. long and weighs 15½ lbs. per foot. Four 3 x 3 x ¼ in. angles are arc welded directly beneath the tie plates between the two flanges of the beam, to act as stiffeners and retainers for the spring clamp. The combination of beam, tie plate, and angles forms a stiff pedestal construction, at the point of maximum load. The spring clamps have enough "give" to create a resiliency to the whole track structure, thereby eliminating any of the detrimental effects that a rigid pedestal might have. Due to the reinforcing effect of the welded tie plates and angles the completed tie has unusual strength for a light weight construction. There are no holes, notches, etc., punched in the tie section to weaken it at any point.

The rails are fastened to the ties by means of clamps of heat-treated, spring steel, four clamps for each tie. The clamps are driven into place with an ordinary spike maul or sledge hammer. As the hook end is driven into place at the base of the rail, the other end of the clamp snaps over the corner of the angle, a hump near the end preventing the clamp from slipping back. To further lock the clamp into position the end engages the web of the tie, forcing the hump firmly against the angle. As the nose of the clamp bears against the base flange of the rail the loop produces a slight spring action which gives the resiliency to the track structure mentioned above. To remove the clamp from the tie a blow is struck with the spike maul against the hump, driving it back over the corner of the angle.

Off on Long Demonstration Tour

A full-fledged gyratory reduction crusher, driven by a power unit and truck mounted is now being used by Allis-Chalmers Mfg. Co., Milwaukee, Wis., to show their latest design crusher unit.

Their new type "R" crusher, although first put on the market only two years ago, is already being extensively used by producers of stone, sand and gravel, cement and mining plants. The mobile unit shown in photograph will travel about the country to demonstrate at the plants of the operators the many special features of this crusher.

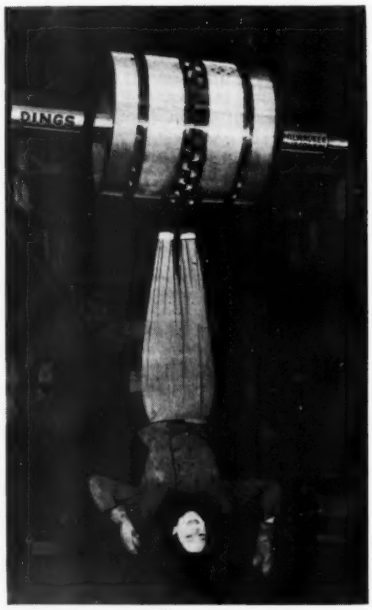
The traveling unit consists of a No. 322 crusher directly driven by an Allis-Chalmers U40 power unit also mounted on the truck chassis. One of the demonstration features of this compact, all-steel constructed crusher is its versatile adjustment feature. A simple oil filled hydraulic jack, located in the bottom plate, supports the main shaft and head mantle. By means of a simple hand cranked pump arrangement, adjustment of crushing head to change the product size can be accomplished in just a few seconds.

This revolutionary feature is of great benefit to the operator as it permits him to change the crusher setting quickly any number of times a day as exacting specifications may require.

The fact that the whole unit is so readily portable illustrates the ease with which it can be shipped from stock, assembled and ready to set on the foundations without dismantling.

The company announces it will send this truck to the plants of many interested operators who were unable to see one of these crushers at the recent Sand and Gravel and Crushed Stone Association shows at Cincinnati. At the same time it permits the operator to try out this crusher on his own materials.

Is This "Tramp Iron"?



You may not have occasion to hang a girl up by the heels but the Dings Magnetic Separator Company's high intensity magnetic pulleys can do it if she has nails in her shoes

Airco Announces Course in Oxyacetylene Welding and Cutting

A comprehensive course of classroom exercises and lectures covering the oxyacetylene welding and cutting processes has just been prepared by Air Reduction, New York. The course consists of two separate books; one containing a complete set of work sheets, and the other lecture material to be used as a supplement to the first.

The book covering classroom exercises describes the practice of both oxyacetylene welding and cutting.

The course of lectures, printed in a separate book gives the history of the art, the properties of its materials, its theories and its practical applications in industry.

The course of classroom exercises sells for 50 cents per copy—lecture books are $1 each. Copies may be obtained by writing Air Reduction Sales Co., 60 East 42nd Street, New York, N. Y.

New Murex A.-C. Rod

Metal & Thermit Corporation, 120 Broadway, New York, N. Y., announces an addition to its line of Murex covered electrodes for manual arc welding. The new electrode, known as Murex Alternex, is designed especially for use with transformer type A.-C. welding equipment and is said to handle extremely well in all positions, including "vertical-down-welding." In the smaller sizes, it may also be used to advantage in welding light-gauge steel.

New Complete Small Washery Announced By McNally-Pittsburg

Coal operators are offered a new McNally-Norton unit coal washery, which includes a raw coal wash box, settling tank, pump sump and recirculating pump, controls, and electric motors. This is the first time the small tonnage mine has been able to buy a McNally-Norton washery built as a single self-contained unit. Its capacity range is 25 to 75 t.p.h. in nut, egg, stove and stoker sizes. Clean coal is returned to the same point at which raw coal enters, simplifying installation.

Components of the box include a McNally-Norton 2 or 3-cell compartment wash box, with air compressor, valves, rejects elevator, automatic refuse controls, and selective gravity control. There is a newly designed settling tank, and washed coal launder, with spiral sludge conveyor. Launders discharge to dewatering washed coal elevator. The recirculating system includes a centrifugal pump, valves, and automatic water pressure relief valve. Complete washery controls and necessary electric motors are integral parts of the new unit.

This new washery is built by The McNally-Pittsburg Mfg. Corp., 307 N. Michigan, Chicago. Their new Unit Washery Bulletin will be sent on request.

Wilson Announces Dual Voltage Switch for Arc Welders

The Wilson Welder & Metals Company, Inc., has just announced a new dual voltage switch for installation on arc welding machines, such as the Wilson "Hornet," when they must be used on either of two line voltages at different times. The new device, known as the Type CH dual voltage switch, can be used on any motor employing A. C. current, provided the motor and starter are reconnectable for two voltages.

The Standard dual voltage switch is designed for 220-440 volts of a delta connected motor—the type used on Wilson welders. It reconnects the stator winding and also adjusts the holding coil of the magnetic starter and heater relays. Other connections, such as 220-440 volts of Y connected motor and of Y delta connection (380/220) are all readily obtainable.

Further information can be obtained by writing us direct at 60 East 42nd Street, New York, N. Y.

New Line of Form-Wheel-Drive Trucks

The trucking industry will see the introduction of a complete line of newly styled FWD trucks for 1941. Attractive new general design and major mechanical improvements that increase the performance of the truck; lighter weight and greater accessibility are features of the 1941 line. The newly designed models of the lighter "H" series are already available and refinements in some 15 other FWD models will soon be announced.

Of special interest is the provision made for use of optional engines which in the "H" series allows for engines from 85 horsepower to 113 horsepower. Two series of axles are also available in these trucks, to take gross loads up to 20,000 pounds. The transfer case is arranged so that a power take off can be installed that will utilize all the speeds of the transmission and the full torque of the motor for earth boring machines and similar services.

The fender arrangement of the new FWDs accommodates all types of snow plows and front end equipment without alterations to the skirting and fenders. Another feature allows for either a high or low mounting of the engine transmission and transfer case, depending upon the height of the body mount. Where center scraper plow and under body graders are used a 23" clearance under the center of the truck is provided.

All models are furnished in both conventional and cab-over-engine design, provision being made for from two to seven passengers in the driver's compartment.

CATALOGS AND BULLETINS

• APRON FEEDER. *Robins Conveying Belt Co.*, Passiac, N. J. Bulletin 112 describes exclusive features of the Robins-Oro manganese steel apron feeder. All wearing parts are made of Oro-Supermang steel, a superior manganese steel. 3 pages.

• BEARINGS. *Stephens-Adamson Mfg. Co.*, Aurora, Ill. Catalog 840 on company's new sealmaster ball bearing units. Describes and illustrates a complete line of advanced designed bearing units, which are pre-lubricated, self-aligning, and feature the permanent sealmaster centrifugal labyrinth seal to keep out dirt and retain lubricant. 32 pages.

• COAL HEATERS. *Locke Stove Co.*, Kansas City, Mo. Booklet illustrating and describing Warm Morning heaters, which incorporate an advanced heating principle. 32 pages.

• CRUSHING AND SCREENING. *Diamond Iron Works, Inc.*, Minneapolis, Minn. Catalog D-41-G illustrates and describes the modern, self-contained Diamond portable crushing and screening plant.

• DRINKING FOUNTAINS. *Bradley Washfountain Co.*, Milwaukee, Wis. 36-page booklet illustrating and describing Bradley washfountains, multi-stall showers, and drinking fountains. Also gives specification data and washroom planning suggestions.

• ELECTRICAL EQUIPMENT. *General Electric Co.*, Schenectady, N. Y. Bulletin GEA-2234C describes manual motor starting switches, line CR1061, for control of fractional horsepower motors. The line includes dust tight and weather resisting switches as well as explosion proof switches.

Bulletin GEA-2599 on Why FH Cubicles? Illustrates safety assured by mechanical interlocks, strength provided by steel construction and savings in installation because cubicles are shipped completely assembled. 23 pages.

Bulletin GEA-3469 illustrates and describes company's new push-button stations. 4 pages.

Ohio Brass Co., Mansfield, Ohio. Company's Insulator Catalog 24 lists all O-B materials for transmission lines, distribution lines and substations, including standard and radio-proof pintype insulators, strain insulators and fittings, insulated clevis assemblies, standard, high-impact and smog-proof suspension insulators, suspension and strain clamps, suspension insulator fittings, other line hardware, pincap and post-type station insulators, oil-filled and dry-type apparatus bushings, entrance bushing and tubes, porcelain condensers, and control gaps. All associated products are grouped in individual sections to make the catalog easy to use. 160 pages.

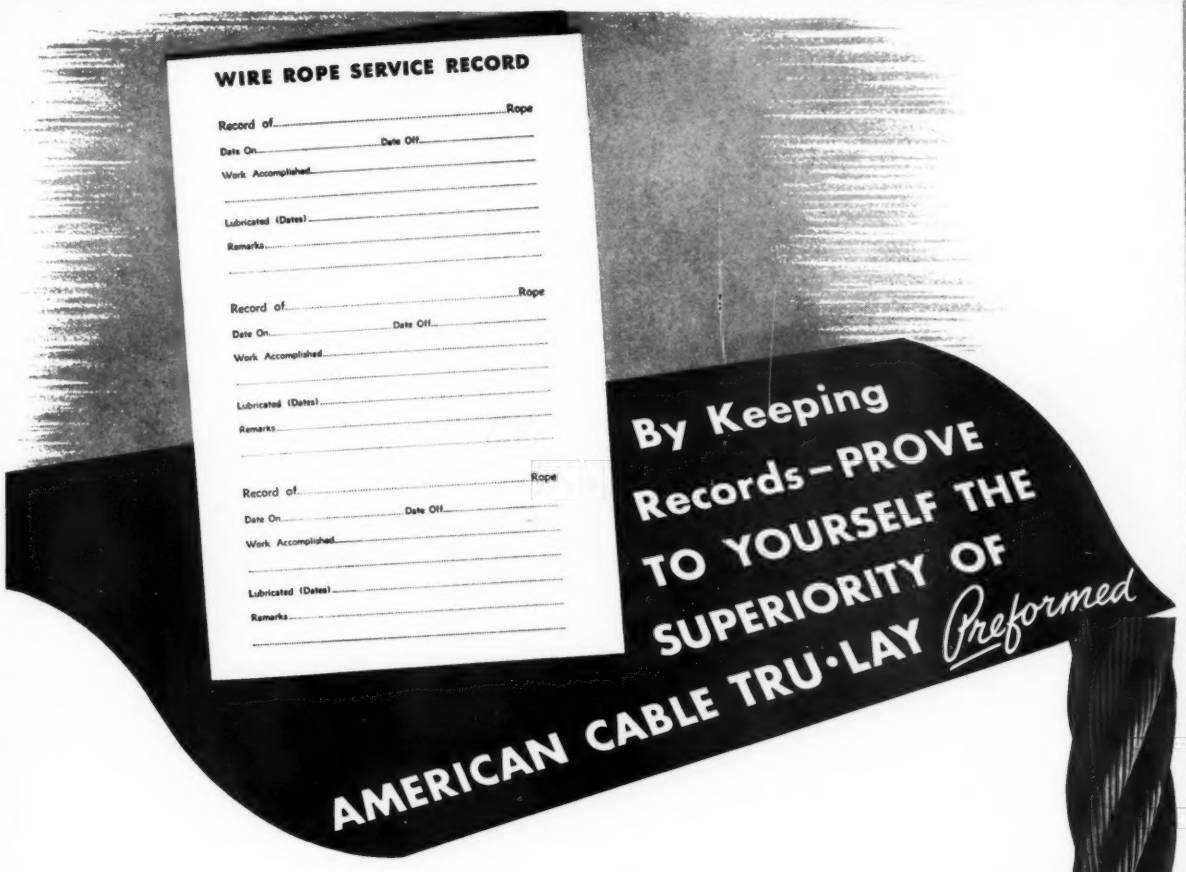
Roller-Smith Co., Bethlehem, Pa. Catalog 3650 illustrates and describes company's Class 250-OS-150 and 250-OS-230 oil circuit breakers.

Catalog 3940 illustrates and describes company's Type MS-2 oil circuit breakers.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Bulletin describing the completely self-protecting CSP power transformers, which are especially designed for unit substation service on municipal or industrial distribution systems. 16 pages. Ask for descriptive data 211.

• METAL CUTTING TOOLS. *Air Reduction Sales Co.*, 60 E. 42nd St., New York City. New 8-page bulletin illustrates and describes Airco No. 10 planograph, designed for cutting straight lines, rectangles, circles and irregular shapes from ferrous metal of any thickness within the present practical limits of the cutting torch.

INDEX TO ADVERTISERS



● One wire rope looks pretty much like another. But some ropes stand up better than others and make your buying money go farther. You can't *guess* what different ropes will do but you can easily keep a performance record. . . . Then you'll *know* what service your rope gives—how many hours or tons of work—how often replaced—and how much time lost for replacement. In short, you'll know exactly what you get for what you pay. . . . American Cable TRU-LAY Preformed Wire Rope shows up exceptionally well in comparative performance tests. It spools even, it handles easy, it reeves fast. Thanks to the preforming we give it. Yes, we like performance tests on TRU-LAY Preformed because they prove this rope extremely economical. . . . Write today for a supply of WIRE ROPE SERVICE RECORD FORMS. They are free. Their use will help increase production and lower costs. They are free of cost and obligation—and may be used with any type or make of wire rope. Prove to yourself that American Cable TRU-LAY Preformed is even *better* than we claim.

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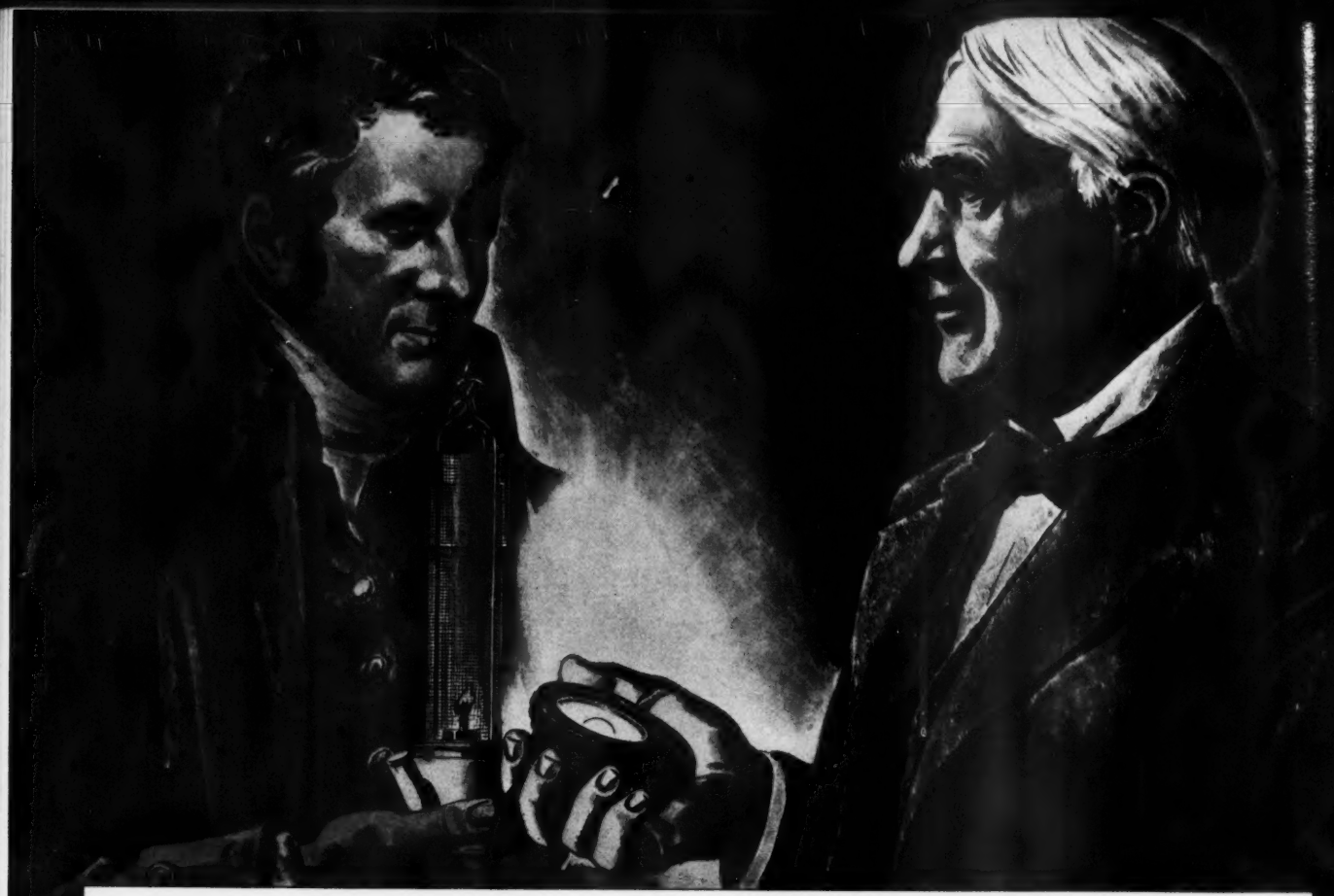
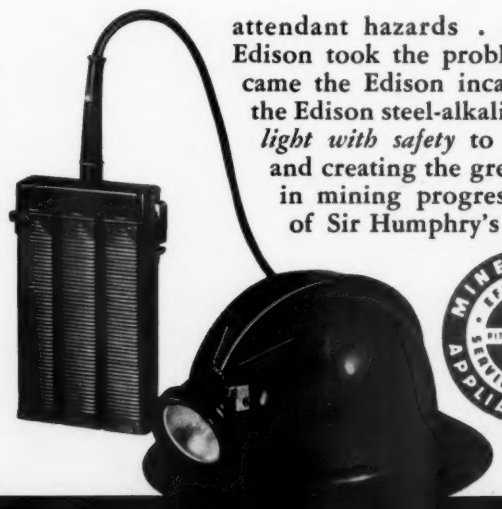


"Sir Humphry Davy, meet Mr. Edison!"

Famed in the lore of mining is Sir Humphry Davy, who first found a safe and practical way to measure the danger-element in mine air. A grateful sovereign knighted the inventor of the Davy Lamp as one of the benefactors of his time • But miners still had to *see* by an open flame, with all its attendant hazards . . . until Thomas Edison took the problem in hand! Then came the Edison incandescent lamp and the Edison steel-alkaline battery, bringing *light with safety* to men underground, and creating the greatest single advance in mining progress since the advent of Sir Humphry's lamp.

Today's EDISON ELECTRIC CAP LAMP provides the finest and most dependable illumination for the miner . . . is the most popular electric cap lamp in the world, and the *only* electric cap lamp powered by the Edison steel-alkaline battery—with a life measured not in months but in years of hard service. Demonstrations gladly arranged on request.



MINE SAFETY APPLIANCES COMPANY

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